TECHNICAL SPECIFICATIONS

SITE IMPROVEMENTS
AND ROOF REPLACEMENT
AT
PAUL BURBANK
ELEMENTARY SCHOOL
HAMPTON, VIRGINIA

JULY 11, 2013

RRMM ARCHITECTS

PRISM ENGINEERING

ROOF CONSULTING SERVICES, INC.

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SECTION 010100 - SUMMARY OF WORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work by Owner.
5. Work under separate contracts.
6. Access to site.
7. Work restrictions.
8. Specification and drawing conventions.

B. Related Requirements:

1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Paul Burbank Elementary School – Site Improvements and Roof Replacement.

1. Project Location: Paul Burbank Elementary School, 40 Tide Mill Lane, Hampton, Virginia 23666.

B. Owner: Hampton City Schools, 1 Franklin Street, Hampton, Virginia 23669.

1. Owner's Representative: Tom Sawyer, Director, School Operations and Maintenance, Hampton City Schools.

C. Architect: RRMM Architects, 1317 Executive Boulevard, Suite 200, Chesapeake, Virginia 23320.

D. Civil: Prism Contractors & Engineers, 5225 George Washington Memorial Highway, Yorktown, Virginia 23692

E. Roof Consultant: Roof Consulting Services Inc., 1660 Mountain Road, Glen Allen, Virginia 232060.

1.4 WORK COVERED BY THE CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. The project scope is generally comprised of site improvements for storm water drainage and roof replacement of approximately 47,470 +/- square feet, including new fascia, coping and metal trim.

B. Type of Contract: The Project will be constructed under a single prime contract.

1.5 CIVIL IMPROVEMENTS DESCRIPTION (Base Bid)

A. The civil portion of the Work provides drainage improvements for the school site where there is currently severe flooding and ponding throughout. All portions of the civil work shall be included in the Base Bid.

B. The Work also includes proposed new roof drains associated with the roof replacement design. A new subsurface storm sewer system which ties into the new proposed roof downspouts will be provided. The storm water run-off will be collected in the proposed storm system where it will then be discharged to adequate BMP's to detain the run-off from the existing impervious surface of the school.

1. All new storm receiver locations shall be coordinated with the roof replacement work and locations of new roof drain downspouts on each building.

C. This design will provide a post-development runoff rate from the site at or below the pre-development runoff rate to satisfy minimum standard 19 (4VAC 50-30-40.19) of the Virginia Erosion and Sediment Control Regulations. There are no additional impervious areas proposed with this project.

1.6 ROOF REPLACEMENT DESCRIPTION (Base Bid & Alternates)

A. The roof replacement Work includes the removal of the existing roof systems along with the corresponding flashings and existing insulations as outlined in detail below. The Work includes the installation of a new two (2) ply modified bitumen roof system installed using cold process adhesives, corresponding flashing, roof insulation and drainage accessories. The work also includes the installation of a new prefinished standing seam metal panel roof assembly including vapor retarder, composite insulation deck board, and underlayments installed over the existing metal decking at Roof Area A-1.

1. The Base Bid Work includes the roof replacement on Roof Area A with new modified bitumen roofing and the roof replacement on Roof Area A-1 with new metal roofing.
2. Alternate #1 (Deductive): includes the roof replacement on Roof Area A-1 with new PVC membrane roofing (in lieu of the metal roofing indicated in the Base Bid.
3. Alternate #2 (Additive) includes the roof replacements on Roof Areas B, C, D, E, F, F-1, & G with new modified bitumen roofing.

B. All necessary precautions shall be taken during construction to protect the existing roof systems on adjacent roof areas which shall remain. No material or debris shall be stored or transferred over any of the roof areas not included in the project.

C. Maintain the building in watertight condition throughout this Contract. Do not permit water to build up on the roof. Provide power hook-ups and pumps on the roof to remove rain that occurs before slopes to drains are achieved. Interior of building to be kept free of water entry of ANY amount throughout the entire roof replacement process.

1. The roofing over each roof area shall be placed so as to have no more roof area open and/or under construction than can be made watertight at the end of each work day.

D. Existing Roof System Compositions: Note: It is the roofing contractor's sole responsibility to field verify all existing conditions prior to submitting their bid.

Roof Area A *(12,054 SF ±)*

1. Cellular metal deck (no exist. slope)
2. 1-1/2" polyisocyanurate insulation
3. 1/2" wood fiber insulation
4. 2 plies fiberglass felts
5. Modified bitumen cap sheet

Roof Area A-1 *(3,916 SF ±)*

1. Cellular metal deck (sloped)
2. 1-1/2" wood fiber insulation
3. Original built-up roof membrane
4. 1" polyisocyanurate insulation
5. EPDM membrane

Roof Areas B, C, D, F, & G (12,054 SF ±)

1. Cellular metal deck (no exist. slope)
2. 1-1/2" wood fiber insulation
3. Original built-up roof membrane
4. Flood coat & gravel surfacing
5. 5/8" fiberglass insulation
6. 2 plies fiberglass felts
7. Modified bitumen cap sheet

Roof Area E *(5,801 SF ±)*

1. Cellular metal deck (no exist. slope)
2. 2" wood fiber insulation
3. Original built-up roof membrane
4. Flood coat & gravel surfacing
5. 1/2" perlite insulation
6. 2 plies fiberglass felts
7. Modified bitumen cap sheet

Roof Area F-1 *(610 SF ±)*

1. Metal deck (sloped)
2. 1-1/2" wood fiber insulation
3. Original built-up roof membrane
4. Flood coat & gravel surfacing
5. 5/8" fiberglass insulation
6. 2 plies fiberglass felts
7. Modified bitumen cap sheet

E. New Roof system Compositions: Note: It is the contractor's responsibility to verify that the proposed roof system composition meets the manufacturers and building code requirements prior to submitting their bid.

Roof Area A (Base Bid)

1. Existing Composite Metal Roof Deck (repaired or replaced as required)
2. New 2" Polyisocyanurate Insulation (mechanically attached)
3. New Tapered Polyisocyanurate Insulation (adhered)
4. New ½" cover board (adhered)
5. New modified bitumen membrane base sheet
   (fully adhered with cold process adhesive and all membrane seams hot air welded)
6. New one ply modified membrane bitumen cap sheet, Energy Star Rated
   (fully adhered with cold process adhesive and all membrane seams hot air welded)

Roof Area A-1 (Base Bid)

1. Existing Metal Roof Deck (repaired or replaced as required)
2. New Vapor Barrier (self-adhered)
3. New 2" Polyisocyanurate insulation (loose laid)
4. New 3-1/2" Insulation Composite Nail Board (mechanically attached)
5. New Underlayment (mechanically attached)
6. New Prefinished Standing Seam Metal Panels
   (mechanically attached with concealed clips)

Roof Area A-1 (Deductive Alternate #1)

1. Existing Metal Roof Deck (repaired or replaced as required)
2. New Vapor Barrier (self-adhered)
3. New 2" Polyisocyanurate insulation (loose laid)
4. New 2" Polyisocyanurate insulation (mechanically attached)
5. New ½" cover board (adhered)
6. New PVC Membrane with Decorative PVC Ribs (fully adhered)

Roof Areas B, C, D, E, F, & G (Additive Alternate #2)

1. Existing Composite Metal Roof Deck (repaired or replaced as required)
2. New 2" Polyisocyanurate Insulation (mechanically attached)
3. New Tapered Polyisocyanurate Insulation (adhered)
4. New ½" cover board (adhered)
5. New modified bitumen membrane base sheet
   (fully adhered with cold process adhesive and all membrane seams hot air welded)
6. New one ply modified membrane bitumen cap sheet, Energy Star Rated
   (fully adhered with cold process adhesive and all membrane seams hot air welded)

Roof Area F-1(Additive Alternate #2)

1. Existing Metal Roof Deck (repaired or replaced as required)
2. New 1-1/2" Polyisocyanurate insulation (loose laid)
3. New 1-1/2" Polyisocyanurate insulation (mechanically attached)
4. New ½" cover board adhered (fully adhered with cold process adhesive)
5. New modified bitumen membrane base sheet (fully adhered with cold process adhesive and all membrane seams hot air welded)
6. New one ply modified bitumen membrane cap sheet (Energy Star Rated - fully adhered with cold process adhesive and all membrane seams hot air welded)

Note:

1. The design documents for the original construction of the buildings indicate that the composite decking is a 'Fenestra' composite deck product. They were noted as follows:
   a. Roof Area A: 6" cellular, 16 gauge topside, 16 gauge bottom sheet
   b. Roof Area A1: 1-1/2" cellular
      i. Field: 16 gauge topside, 16 gauge bottom sheet
      ii. Perimeter: 14 gauge topside, 14 gauge bottom sheet
   c. Roof Area B thru F: 16 gauge topside, 16 gauge bottom sheet
2. Existing deteriorated wood blocking shall be removed and replaced with new treated blocking as required and shown on the roof plans and/or roof details. Additional blocking (if required) shall be installed to match the height of the new roof insulation system and shall provide a minimum 8 inch flashing height as required by the roof system manufacturer. All new blocking shall be fastened to the substrate to meet the specifications.

F. The work consists of removal of all existing roofing down to the structural roof deck, installation of new insulations and installation of a new 2-ply modified bitumen membrane roof system fully adhered with the selected roof membrane manufacturer's cold process adhesive.

   1. On all roof areas, remove all existing roofing materials down to the existing roof deck.

2. On all roof areas, remove all wall flashing, deteriorated wood blocking and associated metal flashings, etc.
3. Asbestos containing material that will be uncovered during the course of the project.
   a. ROOF SAMPLING WAS PERFORMED AND ASBESTOS CONTAINING MATERIALS WERE FOUND IN THE EXISTING ROOFING AT THE FOLLOWING LOCATIONS:
      i. ROOF AREA A: CURB FLASHING & PITCH POCKET FILLER
      ii. ROOF AREA A-1: VAPOR RETARDER & ORIGINAL MEMBRANE
      iii. ROOF AREAS B THRU G: PITCH POCKET FILLER
   b. A COPY OF THE SAMPLING REPORT HAS BEEN INCLUDED IN THESE DOCUMENTS. ASBESTOS-CONTAINING MATERIALS MAY ALSO BE PRESENT IN OTHER AREAS OF THE BUILDING WHERE WORK IS NOT DIRECTLY BEING PERFORMED. THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT ANY REMAINING ASBESTOS-CONTAINING MATERIALS ARE NOT DISTURBED OR DAMAGED, AND WILL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH CLEAN-UP AND CLEARANCE OF THE BUILDING DUE TO DISTURBANCE OR DAMAGE TO ASBESTOS-CONTAINING MATERIALS NOT INCLUDED IN THE SCOPE OF WORK.
   c. REMOVE AND DISPOSE OF ASBESTOS-CONTAINING MATERIALS, IF APPLICABLE, SHALL BE IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL LAWS.
   d. IF APPLICABLE, THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEVELOPING A PROJECT APPROACH BY COORDINATING WITH THE VARIOUS SUBCONTRACTORS PERFORMING OTHER COMPONENTS OF THE CONTRACT. THE SPECIFIC WORK TECHNIQUES AND PRACTICES SELECTED TO EXECUTE THE CONTRACT WILL DETERMINE THE ABATEMENT MEASURES, IF ANY, REQUIRED. THE PROJECT APPROACH SHALL BE BASED ON HISTORICAL DATA AND EXPERIENCE WITH PROJECTS OF SIMILAR SCOPE.
   e. IF APPLICABLE, THE CONTRACTOR WILL BE REQUIRED TO PROVIDE THE OWNER WITH A DISPOSAL MANIFEST OF ALL ASBESTOS CONTAINING MATERIAL REMOVED FROM THE PROPERTY. THIS MANIFEST SHALL ACCOMPANY EACH APPLICATION FOR PAYMENT.
4. Furnish and install new treated wood blocking to replace deteriorated at all roof perimeters, roof curbs, expansion joints and all other locations as required by the roof system manufacturer's standard requirements. Unit prices, as outlined in Section 01026, shall be used as an Add/Deduct from the lump sum bid dollar amount. The Contractor's on site representative shall keep a daily log and running total of areas of roof deck replacement / repairs with daily signatures being obtained from the Owner's on site representative.
5. Install new wood blocking (as required) to accommodate the height of the new roof insulation system and provide a minimum 8" flashing height (to be included in the Base Bid – unit cost based allowances will not apply to these items).
6. Remove areas of deteriorated or damaged metal roof deck and replace with new to match the existing type, gauge, configuration, thickness or size. Unit prices, as outlined in Section 01026, shall be used as an Add/Deduct from the lump sum bid dollar amount. The Contractor's on site representative shall keep a daily log and running total of areas of roof deck replacement / repairs with daily signatures being obtained from the Owner's on site representative.
7. If required, wire brush, properly clean and paint areas of corroded metal roof decking with Sherwin Williams B66W1 DTM. Unit prices, as provided in Section 01026, shall be used as and Add/Deduct from the lump sum bid dollar amount. The Contractor shall keep a daily log and running total of areas of decking treatment with daily signatures being obtained from the Owner's project manager.

8. Remove all abandoned equipment as indicated on the roof plans or instructed by the Owner. Repair all holes in the roof deck as required to provide a structurally sound roof deck condition at all locations of equipment removal (to be included in the Base Bid – unit cost based allowances will not apply to these items).
9. Remove and replace all existing fractional horse power exhaust fan units and curbs with new units and curbs to match the existing size, type, motor, controls, voltage and CFM.
    a. All required mechanical and electrical work shall be performed by licensed mechanical and electrical subcontractors. All mechanical and electrical work shall comply with all applicable codes and the Contractor shall be responsible for providing all required inspections.
10. At Roof Area A, check all existing drain lines for clogs or blockages. Report any clogged drains to Architect immediately. Clean all existing drain bowl assemblies and replace existing bolts, clamping rings and strainers with new to match existing assembly.
11. At Roof Areas B - G, All existing roof drain bowls are to be removed. Repair the roof deck with minimum 18 gauge flat stock metal screwed to the roof deck with minimum 1/4 x 1-1/2 inch self-tapping screws 6 inches on center. Remove all associated interior piping at drain bowl locations to closest vertical drop location and cap vertical line. (To be included in the Base Bid – unit cost based allowances will not apply to these items.)
12. Furnish and install new 30”x36” roof hatch to replace existing.
13. On all roof areas, furnish and install new flat and/or tapered polyisocyanurate insulation (mechanically attached or adhered) as specified and required by Section 07220 – Roof Insulation.
14. Furnish and install new crickets, drain sumps or tapered edge strips as required or shown to provide positive drainage.
15. Furnish and install new 1/2 inch cover board adhered with roof membrane manufacturer’s cold process adhesive. Cover board must be installed after new crickets and drain sumps (if any).
16. Furnish and install a one (1) ply modified bitumen membrane base sheet fully adhered with selected roof membrane manufacturers cold process adhesive.
17. Furnish and install new granular surfaced modified bitumen membrane cap sheet (Energy Star Rated) with selected roof membrane manufacturer’s cold process adhesive. Hot air weld all membrane seams.
18. Furnish and install new base flashing and stripping at all walls, curbs, expansion joints, gravel stop edges and other roof penetrations with proper termination as required or shown.
19. Furnish and install new termination bar and metal counter flashings as required or shown.
20. Furnish and install new metal panel roof system at Roof Area A-1 as required and shown.
21. Furnish and install new perimeter edge metals, drip edges, gutters, downspouts and conductor heads as required or shown.
    a. Coordinate the locations of all new downspouts with locations of new storm receivers as indicated on the civil drawings.
22. Furnish and install new granular surfaced protective walk pads around all motorized equipment, entrance doors, roof hatches and stationary ladders.
23. At the rising walls between Roof Areas A and A-1, furnish and install new flush mounted wall panels.
24. At all roof areas, furnish and install new metal fascia extender and metal soffit at existing overhangs as shown.

1.7 ALTERNATES

A. Deductive Alternate #1: The Contractor shall include all work associated with the removal

and replacement of Roof Area A-1 with new high thermal insulation and fully adhered PVC membrane with decorative PVC ribs (in lieu of the metal roofing specified in the Base Bid). The Work shall include all associated components, flashings, and trim metals and shall be installed in accordance with the manufacturer's published requirements. The Contractor shall provide a manufacturer's 20-year no dollar limit, labor and materials warranty on the system.

B. Additive Alternate #2: The Contractor shall include all Work associated with the removal of the existing roofing and replacement with the new high thermal tapered insulation and modified bitumen membrane system on Roof Areas B, C, D, E, F, F-1, & G as indicated in the Contract Documents. The Work shall include all associated components, flashings, and trim metals and shall be installed in accordance with the manufacturer's published requirements.

1.8 WORK BY OWNER OR UNDER OTHER CONTRACTS

B. General: Work indicated in the documents as "NIC" (Not in Contract), "By Owner", or "By Others" is not included under this Contract.

B. Work by Owner: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

C. Separate Contracts: Other work at the project site may be furnished and installed either by the Owner with his own forces or by the Owner's separate contractors. This work will be performed concurrent with the execution of the Work of this Contract.

1. Coordination of Separate Contract Work: The Contractor shall cooperate with Others performing Work for this project and coordinate their work as follows:
   a. Allow them access to the Work.
   b. Provide secure space on the site and/or in the building as necessary, for storage of tools, materials, and supplies.
   c. Arrange and coordinate all work under this Contract so that work can be carried out smoothly without interfering or delaying the Work of this Contract or the Work of Others.
2. Considerations: The intention of the Owner to perform work with his own forces or to employ separate contractors shall be given due consideration prior to the submission of a bid and any additional cost which the Contractor believes to be associated with work by others shall be included in the cost of the Work.

1.9 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated.

1. Weekend Hours: Coordinate with Owner.
2. Early Morning Hours: Coordinate with Owner.
3. Hours for Utility Shutdowns: Coordinate with Owner.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Architect and Owner not less than two (2) days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.

E. Employee Screening: Comply with Owner's requirements for drug screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

1.10 SUMMARY OF REFERENCES

A. Work of Contract can be summarized by reference to the Contract, Advertisement For Bids, General Conditions, Supplementary Conditions, Specification Sections, as listed in the specification Index, Bound herewith; Drawings, as listed in the drawing Index, bound herewith; Addenda and Modifications to the Contract Documents, issued subsequent to the initial printing of this project manual, and including, but not necessarily limited to, printed matter referenced by any of these. It is recognized that Work of Contract is also unavoidably affected or influenced by governing regulations, natural phenomena, including weather conditions, and other forces outside the Contract Documents.

1.11 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to areas affected by new work, Contractor’s staging and storage. Limit disturbance of surroundings to the minimum required to complete the work.
2. Driveways, Walkways and Entrances: Keep driveway and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and building occupants during the construction period.

D. Preconstruction Survey: The Contractor shall perform a preconstruction survey of the existing site and building to document any deficiencies that could be attributed to construction activities. The survey shall be reviewed with the Construction Manager prior to commencing on site operations.

1.12 CONTRACTOR USE OF PREMISES

A. Cooperate with Owner in devising a plan to allow safe ingress and egress during construction.

B. Keep driveways and entrances serving the premises clear and available to the Owner and the Owner's employees at all time. Do not use these areas for parking or storage of materials.

C. The Contractor shall indicate at the Pre-construction meeting the location and limits of staging areas that he anticipates utilizing for approval by Owner.

D. Site Safeguards: It shall be the Contractor's responsibility to take all prudent and reasonable measures and to comply with the local codes and governing jurisdictions to provide such safeguards as necessary to maintain the construction site and adjacent areas as well as the work in progress in a manner so as to protect the workperson and the public from harm resulting from the construction work and related operations.

1.13 OWNER OCCUPANCY

A. The Owner will occupy the site and the existing building during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the work so as not to interfere with the Owner's daily operations.

B. It is the contractor’s responsibility to do all things necessary to protect the interior of the building during construction. Proper watertight tie-ins shall be required on a daily basis. Any and all damages to the Owners property due to improper or lack of tie-ins shall be immediately repaired by the contractor at no cost to the Owner.

1.14 JOB SITE TRAFFIC CONTROL

A. Construction traffic shall obey all traffic requirements as posted within the school site. Where speed limits are not posted, limit speeds to no greater than 10 mph.

B. Construction deliveries to the site shall be coordinated so as to not interfere with the Owner’s normal hours of operation. The Owner’s normal working hours are Monday through Friday, 7:00 AM until 5:00 PM.

1.15 MECHANICAL/ELECTRICAL GENERAL REQUIREMENTS

A. All required mechanical and electrical work shall be performed by licensed mechanical and electrical subcontractors and performed by licensed tradesmen of that firm.. All mechanical and electrical work shall comply with all applicable codes and the Contractor shall be responsible for providing all required inspections.

1.16 CONTRACTOR CONDUCT

A. The Contractor shall strictly prohibit weapons, drugs, alcohol and tobacco products in the

Owner's building and on the Owner's property. A dress code which requires all construction personnel to wear shirts at all times (without slogans) will be strictly enforced.

B. No smoking shall be allowed in the building or on Owner's property at any time.

1.17 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 010100

SECTION 010260 - UNIT PRICE BASED ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for unit prices.

B. A unit price is an amount established by the Contract Documents and stated herein as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the estimated quantities of Work required by the Contract Documents are increased or decreased.

C. Unit prices include all necessary material, overhead, profit and applicable taxes. No additional mark-ups or compensation will be paid by the Owner.

D. Refer to individual Specification Sections for construction activities requiring the establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

E. Quantities will be calculated jointly by Contractor, Architect, and the Owner's representative. Quantities shall be calculated by actual area or length. All work shall be supervised and approved by the Owner's representative prior to completion.

1.3 SCHEDULE

A. A "Unit Price Based Allowance Schedule" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials and methods described under each unit price.

B. The Owner reserves the right to reject the Contractor's measurement of work-in-place that involves use of established unit prices, and to have this Work measured by an independent surveyor acceptable to the Contractor at the Owner's expense.

1.4 COSTS

A. No change order involving unit price based allowances will be paid unless the Owner's representative approved the change order prior to the work being completed.

1.5 SUBMITTALS

A. Submit data for purchase of products or systems included in allowances.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

1.6 CONTINGENCY

A. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under an allowance are included in the allowance. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

B. At Project closeout, credit unused amounts remaining in the allowance to Owner by Change Order.

1.7 REDUCTIONS IN QUANTITIES OF WORK

A. Should less work be required than that required by the Contract Documents, reductions in the Contract Sum will be adjusted by unit prices established above less ten (10) percent

B. Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If it is not economically practical to return the material for credit, removal from the site and disposal of unused material is Contractor's responsibility.

1.8 DOCUMENTATION

A. The Contractor’s on-site representative shall keep a daily log and running total of items encountered under the Unit Price Based Allowances with daily signatures being obtained from the Owner’s on site representative.

1. The daily log shall include documentation of the location and quantity of the items on a corresponding roof plan.

B. The Contractor shall document all Unit Price Based Allowances with photographs of the deteriorated ‘before’ condition and the completed ‘after’ conditions. The Contractor shall provide his on-site representative with a camera for the purposes of the photographic documentation.

1. The Contractor shall provide the Owner with electronic copies of all photographic documentation prior to payment for the Unit Cost Allowance items.

PART 2 - PRODUCTS (Not Applicable)

(Continue to next page for Unit Price Based Allowance Schedule)

PART 3 - EXECUTION

3.1 UNIT PRICE BASED ALLOWANCE SCHEDULE

A. Burbank Elementary School:

Item	Description	Unit	Base Bid Quantity
1 **2** **3** **4**	**Wood Blocking Replacement**: Removal and replacement of deteriorated 2x pressure treated wood blocking	LF	2 x 4 = Include 100 LF 2 x 6 = Include 100 LF 2 x 8 = Include 100 LF 2 x 10 = Include 100 LF
5	**Metal Decking Treatment**: Installed price per square foot to clean, prime and paint deteriorated areas of the existing metal decking as required.	SF	Include 1,000 SF of Metal Deck Treatment.
6	**Metal Deck Overlay:** Installed price per square foot to overlay the existing deteriorated metal decking with new 18 gauge galvanized sheet metal as required.	SF	Include 500 SF of Metal Deck overlay.
7	**Cellular Metal Deck Replacement:** Installed price per square foot to replace the existing deteriorated metal decking with new galvanized cellular metal decking to match as required.	SF	Include 500 SF of Cellular Metal Deck replacement.
8	**Plywood Sheathing/Blocking Replacement**: Installed price per square foot to replace existing deteriorated plywood with new FRT plywood to match existing thickness as required.	SF	Include 250 SF of deck replacement.
9	**Roof Drain replacement**: Installed price per drain to replace an existing damaged roof drain assembly including required connections and tie-ins as required.	EA.	Include two (2) roof drain replacements.

END OF SECTION 010260

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SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and the general provisions of Contract, including General and Supplemental Conditions and Division-1 specification sections, apply to work of this section.

1.2 DESCRIPTION

A. This section contains instructions and references which relate to additive and deductive alternates. The Owner may elect to modify certain aspects of the work as specified in consideration for change to the Contract Amount.

B. Bidders shall submit, with their Bids, pricing for each item listed in Schedule of Alternates.

C. If Alternates are accepted by Owner, the Contract Amount shall be adjusted by an amount listed in the Form of Proposal.

D. The successful Bidder shall coordinate all related work, and modify or adjust adjacent work as necessary to ensure that work affected be each accepted Alternate is complete and fully integrated into the Project.

1.3 SCHEDULES OF ALTERNATES

A. Bid Alternate No. 1 (Deductive) - New PVC Roof System on Roof Area A-1

The Contractor shall include all work associated with the removal and replacement of Roof Area A-1 with new high thermal insulation and fully adhered PVC membrane with decorative PVC ribs (in lieu of the metal roofing specified in the Base Bid). The Work shall include all associated components, flashings, and trim metals and shall be installed in accordance with the manufacturer's published requirements. The Contractor shall provide a manufacturer's 20-year no dollar limit, labor and materials warranty on the system.

B. Bid Alternate No. 2 (Additive) – New Modified Bitumen Roof Systems on Roof Areas B - G

The Contractor shall include all Work associated with the removal of the existing roofing and replacement with the new high thermal tapered insulation and modified bitumen membrane system on Roof Areas B, C, D, E, F, F-1, & G as indicated in the Contract Documents. The Work shall include all associated components, flashings, and trim metals and shall be installed in accordance with the manufacturer's published requirements.

PART 2 – PRODUCTS (Not used)

PART 3 – EXECUTION (Not used)

END OF SECTION 012300

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SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Division 01 Section "Allowances" for products selected for an allowance.
2. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than fifteen (15) days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

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SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Division 01 Section "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
2. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within twenty (20) days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Division 01 Section "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on an approved change order form.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive Change Directive, which instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

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SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

    a. Application for Payment forms with continuation sheets.
    b. Submittal schedule.
    c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Architect at earliest possible date, but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Name of Architect.
    c. Architect's project number.
    d. Contractor's name and address.
    e. Date of submittal.

2. Arrange schedule of values in an approved format.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Change Orders (numbers) that affect value.
    d. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

        1) Labor.
        2) Materials.
        3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

1. Submit draft copy of Application for Payment three (3) days prior to due date for review by Architect.

C. Application for Payment Forms: Use Schedule of Values and an approved format for Certificate for Payment as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit five (5) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within twenty-four (24) hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Submittal schedule (preliminary if not final).
5. List of Contractor's staff assignments.
6. Copies of building permits.
7. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
8. Report of preconstruction conference.
9. Certificates of insurance and insurance policies.
10. Performance and payment bonds.
11. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. Evidence that all issues related to pre-construction survey have been resolved.
5. Evidence that claims have been settled.
6. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
7. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:

1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.

2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within fifteen (15) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Form bound in Project Manual.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven (7) working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within ten (**10)** days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Use CSI Log Form or an approved format.

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within five (5) days if Contractor disagrees with response.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three (3) days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than fifteen (15) days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Critical work sequencing and long-lead items.
    c. Designation of key personnel and their duties.
    d. Lines of communications.
    e. Procedures for processing field decisions and Change Orders.
    f. Procedures for RFIs.
    g. Procedures for testing and inspecting.
    h. Procedures for processing Applications for Payment.
    i. Distribution of the Contract Documents.
    j. Submittal procedures.
    k. Preparation of record documents.
    l. Use of the premises and existing building.
    m. Work restrictions.
    n. Working hours.
    o. Owner's occupancy requirements.
    p. Responsibility for temporary facilities and controls.
    q. Procedures for moisture and mold control.
    r. Procedures for disruptions and shutdowns.
    s. Construction waste management and recycling.
    t. Parking availability.
    u. Office, work, and storage areas.
    v. Equipment deliveries and priorities.
    w. First aid.
    x. Security.
    y. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Refer to Specification Manual for section requiring pre-installation conferences.

D. Progress Meetings: Conduct progress meetings at bimonthly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Progress cleaning.
        10) Quality and work standards.
        11) Status of correction of deficient items.
        12) Field observations.
        13) Status of RFIs.
        14) Status of proposal requests.
        15) Pending changes.
        16) Status of Change Orders.
        17) Pending claims and disputes.
        18) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

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SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Construction schedule updating.
3. Daily construction reports.
4. Material location reports.
5. Site condition reports.
6. Special reports.

B. Related Requirements:

1. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
2. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF file.
2. Two (2) paper copies.
3. Native format electronic schedule file.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

C. Construction Schedule Updating: Submit with Applications for Payment.

D. Daily Construction Reports: Submit in accordance with paragraph 3.1B.

E. Special Reports: Submit at time of unusual event.

F. Qualification Data: For scheduling consultant.

1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Recovery Schedule: When periodic update indicates the Work is fourteen (14) or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

C. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules by Oracle/Primavera (P3 or Sure Trak) or Microsoft (Project).

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than fourteen (14) days after date established for the Notice to Proceed.

a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Use "one workday" as the unit of time for individual activities. Indicate nonworking days including weather days specified in supplemental conditions, paragraph 3.10.4.2 and holidays incorporated into the schedule in order to coordinate with the Contract Time.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.

4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Emergency procedures.
12. Orders and requests of authorities having jurisdiction.
13. Change Orders received and implemented.
14. Construction Change Directives received and implemented.
15. Partial completions and occupancies.
16. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one (1) day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Contractor's Construction Schedule Updating: At bi-weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule two (2) days before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

C. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

END OF SECTION 013200

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SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled date of fabrication.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.

1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.

    a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    b. Digital Drawing Software Program: The Contract Drawings are available in AutoCAD 2010 format.

c. Contractor shall execute a data licensing agreement in provided by the Architect.
d. The indicated Contract Drawings will be provided to the Contractor for a processing fee of One Hundred Dollars ($100.00).
e. The following digital data files will by furnished for each appropriate discipline:

1) Floor plans.
2) Reflected ceiling plans.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow fifteen (15) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow fifteen (15) days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow twenty-one (21) days for initial review of each submittal.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 on label or beside title block to record Contractor's review and approval markings and action taken by Architect.

3. Include the following information for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Name of subcontractor.
    f. Name of supplier.
    g. Name of manufacturer.
    h. Number and title of appropriate Specification Section.
    i. Drawing number and detail references, as appropriate.
    j. Location(s) where product is to be installed, as appropriate.
    k. Other necessary identification.

4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

    a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return without review submittals received from sources other than Contractor.

    a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

        1) Project name.
        2) Date.
        3) Destination (To:).
        4) Source (From:).
        5) Name and address of Architect.
        6) Name of Contractor.
        7) Name of firm or entity that prepared submittal.
        8) Names of subcontractor, manufacturer, and supplier.
        9) Category and type of submittal.
        10) Submittal purpose and description.
        11) Specification Section number and title.
        12) Specification paragraph number or drawing designation and generic name for each of multiple items.
        13) Drawing number and detail references, as appropriate.
        14) Indication of full or partial submittal.
        15) Transmittal number, numbered consecutively.
        16) Submittal and transmittal distribution record.
        17) Remarks.
        18) Signature of transmitter.

E. Electronic Submittals: Electronic PDF files will be accepted by the Architect. Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Contractor.
    e. Name of firm or entity that prepared submittal.
    f. Names of subcontractor, manufacturer, and supplier.
    g. Category and type of submittal.
    h. Submittal purpose and description.
    i. Specification Section number and title.
    j. Specification paragraph number or drawing designation and generic name for each of multiple items.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Related physical samples submitted directly.
    n. Indication of full or partial submittal.
    o. Transmittal number, numbered consecutively.
    p. Submittal and transmittal distribution record.
    q. Other necessary identification.
    r. Remarks.

F. Options: Identify options requiring selection by Architect.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files.

    a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: Submit seven (7) paper copies of each submittal unless otherwise indicated. Architect will return three (3) copies.
3. Informational Submittals: Submit four (4) paper copies of each submittal unless otherwise indicated. Architect will not return copies.
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.

b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data**,** unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.

d. Number and title of applicable Specification Section.
e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one (1) full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit three (3) sets of Samples. Architect will retain two (2) Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.

        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.

4. Location within room or space.

F. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

I. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

Q. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

R. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

S. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three (3) paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

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SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Requirements:

1. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five (5) previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Shop Drawings: For mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.

1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

A. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor**,** and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least forty-eight (48) hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Structural and Special Inspections List and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.

2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions.
2. Section 321313 "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

1. Coordinate with separate mechanical contractor for payment of their portion of temporary use charges. The Owner will not incur additional cost from either contractor for use charges related to temporary facilities.

B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water-service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Maintain a clean site, clear of construction debris to fullest extent possible. Construction staff shall take measure to clean grounds from small construction materials that may become projectiles during mowing operations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch- OD corner and pull posts.

B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide concrete or galvanized-steel bases for supporting posts.

2.2 TEMPORARY FACILITIES

A. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

D. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

E. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

F. Temporary Use of Existing Permanent Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated or within construction limits indicated on Drawings. Maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Temporary access road has been installed to the rough sub-base grade under separate early site package contract. This contract allows the use of that roadway; however, it is the responsibility of this general contractor to maintain and recondition the roadway as follows.
2. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.

G. Parking: Provide temporary parking areas for construction personnel.

H. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

I. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Temporary Signs: Provide signs as indicated and as required to inform public and individuals seeking entrance to Project.
2. Maintain and touchup signs so they are legible at all times.

J. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

K. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Division 01 Section "Execution."

L. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."

1. Maintain existing erosion- and sediment-controls installed under early site package contract and provide additional measures as necessary during the construction process.

D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sediment-control Drawings, requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

E. Tree and Plant Protection: Install temporary fencing located outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas.
2. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Instruct personnel in methods and procedures. Post warnings and information.

3.4 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Periodically collect and remove waste containing cellulose or other organic matter.
2. Discard or replace water-damaged material.
3. Do not install material that is wet.
4. Discard, replace, or clean stored or installed material that begins to grow mold.
5. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures.

C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Division 01 Section "Substitution Procedures" for requests for substitutions.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
    b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Products:

    a. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

2. Manufacturers:

    a. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

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SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.
9. Correction of the Work.

B. Related Requirements:

1. Division 01 Section "Summary" for limits on use of Project site.
2. Division 01 Section "Submittal Procedures" for submitting surveys.
3. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.

C. Cutting and Patching Plan: Submit plan describing procedures at least ten (10) days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.5 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

    a. Primary operational systems and equipment.
    b. Fire-suppression systems.
    c. Mechanical systems piping and ducts.
    d. Control systems.
    e. Communication systems.
    f. Fire-detection and -alarm systems.
    g. Electrical wiring systems.
    h. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

    a. Water, moisture, or vapor barriers.
    b. Membranes and flashings.
    c. Exterior curtain-wall construction.
    d. Sprayed fire-resistive material.
    e. Equipment supports.
    f. Piping, ductwork, vessels, and equipment.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings. If discrepancies are discovered, notify Architect promptly.

B. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work.

C. Record Log: Maintain a log of layout control work. Make the log available for reference by Architect.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Proceed with patching after construction operations requiring cutting are complete.

E. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

F. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls." and Division 01 Section "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

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SECTION 017400 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for cutting and patching.

B. Reference to Other Sections:

1. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
2. Requirements of this Section apply to mechanical and electrical installations. Refer to Division-15 and Division-16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

C. Demolition: Demolition requirements are included in Section 02070, "Selective Demolition."

1.3 SUBMITTALS

A. Submit the following in accordance with conditions of the Contract and Division 1 specification Section 01300, "Submittals."

1. Cutting and Patching Proposal:

a. Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:
b. Describe the extent of cutting and patching required and how it is to be performed.
c. Describe anticipated results in terms of changes to construction; include changes to structural elements and operating components.
d. Indicate dates when cutting and patching is to be performed.
e. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
f. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.

1.4 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:

1. Foundation construction.
2. Bearing and retaining walls.
3. Structural concrete.
4. Structural steel.
5. Lintels.
6. Structural decking.
7. Miscellaneous structural metals.
8. Equipment supports.

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

D. Safety Requirements: No cutting and patching of the roof deck will take place at anytime while the building is occupied.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials that are identical to original materials. Use materials whose installed performance will equal or surpass that of original materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before cutting surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building.

3.3 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Cut through concrete and masonry using a cutting machine such as carborundum saw or diamond core drill.
4. Comply with requirements of applicable Sections of Division-2 where cutting and patching requires excavating and backfilling.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.

a. Where patching occurs in a smooth painted surface, extend final paint coat over entire surface containing the patch, after the patched area has received primer and second coat. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance. Replace damaged ceiling tiles with units to match original or if not available, replace ceiling tiles with new units throughout space.

3.4 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION 017400

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SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous construction waste.
2. Recycling nonhazardous construction waste.
3. Disposing of nonhazardous construction waste.

B. Related Requirements:

1. Division 04 Section "Unit Masonry" for disposal requirements for masonry waste.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Maximize rates for salvage/recycling of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Construction Waste:
   a. Lumber.
   b. Metals.
   c. Roofing.
   d. Insulation.
   e. Piping.
   f. Electrical conduit.
   g. Packaging: Salvage or recycle 100 percent of the following uncontaminated packaging materials:

      1) Paper.
      2) Cardboard.
      3) Boxes.
      4) Plastic sheet and film.
      5) Polystyrene packaging.
      6) Wood crates.
      7) Plastic pails.

1.5 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 RECYCLING CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.2 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

3.3 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Division 01 Section "Execution" for progress cleaning of Project site.
2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
4. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
5. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by the Owner. Label with manufacturer's name and model number where applicable.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain the Owner signature for receipt of submittals.

5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Instruct Owner's personnel in operation, adjustment, and maintenance of products and equipment. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."

3. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
4. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
5. Complete final cleaning requirements, including touchup painting.
6. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a completed Substantial Completion form a minimum of ten (10) days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit completed Final Report of Structural Special Inspection form.

B. Inspection: Submit a completed Final Completion form for final inspection to determine acceptance a minimum of ten (10) days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order that is consistent with the Contract Documents.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in one (1) of the following formats:

    a. MS Excel electronic file. Architect will return annotated file.
    b. PDF electronic file. Architect will return annotated file.
    c. Three (3) paper copies. Architect will return two (2) copies.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, trenches, manholes, and similar spaces.
    h. Remove labels that are not permanent.

i. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
j. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

    a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Product maintenance manuals.

B. Related Requirements:

1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

    a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    b. Enable inserted reviewer comments on draft submittals.

2. Three (3) paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two (2) copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least thirty (30) days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least fifteen (15) days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within fifteen (15) days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of equipment.
3. Table of contents.

B. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

C. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

D. Identification: In the documentation directory and in each operation and maintenance manual, identify each piece of equipment with same designation used in the Contract Documents.

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Architect.
7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
8. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of

contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.

3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Division 01 Section "Project Record Documents."

F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Product Data.
3. Miscellaneous record submittals.

B. Related Requirements:

1. Division 01 Section "Execution" for final property survey.
2. Division 01 Section "Closeout Procedures" for general closeout procedures.
3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one (1) set of marked-up record prints.

a. Initial Submittal:

1) Submit one (1) paper-copy set of marked-up record prints.
2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit one (1) paper-copy set of marked-up record prints.
2) Provide each drawing, whether or not changes and additional information were recorded.

B. Reports: Submit written report biweekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an acceptable drawing technique.
    c. Record data as soon as possible after obtaining it.
    d. Record and check the markup before enclosing concealed installations.
    e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Locations and depths of underground utilities.
    d. Revisions to routing of piping and conduits.
    e. Revisions to electrical circuitry.
    f. Actual equipment locations.
    g. Locations of concealed internal utilities.
    h. Changes made by Change Order or Construction Change Directive.
    i. Changes made following Architect's written orders.
    j. Details not on the original Contract Drawings.
    k. Field records for variable and concealed conditions.
    l. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

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SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

B. Related Requirements:

1. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

B. Qualification Data: For facilitator or instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two (2) copies within seven (7) days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.
d. Name of Contractor.
e. Date of video recording.

2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
4. At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals and in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.

b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

   a. Diagnostic instructions.
   b. Test and inspection procedures.

7. Maintenance: Include the following:

   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.

8. Repairs: Include the following:

   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Architect, with at least seven (7) days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 × 480 video resolution converted to format file type acceptable to Owner, on electronic media.

1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

    a. Produce segments to present a single significant piece of equipment per segment.
    b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

END OF SECTION 017900

SECTION 024116 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section requires the selective removal and subsequent offsite disposal of the following:

1. The existing modified built-up and EPDM membrane roof systems as indicated in the contract documents and as required to accommodate a new roof system installation.
2. Existing deteriorated wood blocking.
3. Deteriorated areas of composite metal roof decking.
4. Obsolete penetrations and equipment as indicated on the roof plans and/or directed by the Owner.
5. Asbestos containing material that may be uncovered during the course of the project.

a) ROOF SAMPLING WAS PERFORMED AND ASBESTOS CONTAINING MATERIALS WERE FOUND IN THE EXISTING ROOFING AT THE FOLLOWING LOCATIONS:

i. ROOF AREA A: CURB FLASHING & PITCH POCKET FILLER
ii. ROOF AREA A-1: VAPOR RETARDER & ORIGINAL MEMBRANE
iii. ROOF AREAS B THRU G: PITCH POCKET FILLER

(A COPY OF THE SAMPLING REPORT HAS BEEN INCLUDED IN THESE DOCUMENTS.)

b) ASBESTOS-CONTAINING MATERIALS MAY BE PRESENT IN OTHER AREAS OF THE BUILDING WHERE WORK IS BEING PERFORMED. THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT ANY ASBESTOS-CONTAINING MATERIALS THAT ARE ENCOUNTERED ARE NOT DISTURBED OR DAMAGED, AND WILL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH CLEAN-UP AND CLEARANCE OF THE BUILDING DUE TO DISTURBANCE OR DAMAGE TO ASBESTOS-CONTAINING MATERIALS NOT INCLUDED IN THE SCOPE OF WORK.

b) IF ENCOUNTERED, REMOVE AND DISPOSE OF ASBESTOS-CONTAINING MATERIALS IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL LAWS.

c) THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEVELOPING A PROJECT APPROACH BY COORDINATING WITH THE VARIOUS SUBCONTRACTORS PERFORMING OTHER COMPONENTS OF THE CONTRACT. THE SPECIFIC WORK TECHNIQUES AND PRACTICES SELECTED TO EXECUTE THE CONTRACT WILL DETERMINE THE ABATEMENT MEASURES REQUIRED. THE PROJECT APPROACH SHALL BE BASED ON HISTORICAL DATA AND EXPERIENCE WITH PROJECTS OF SIMILAR SCOPE.

d) ALL REMOVAL AND DISPOSAL OF IDENTIFIED ASBESTOS CONTAINING MATERIALS SHALL BE IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS.

B. Removal work specified elsewhere:

1. Roofing membrane and roof insulation removal.

1.3 SUBMITTALS

A. General: Submit the following in accordance with the contract documents.

B. Schedule indicating proposed sequence of operations for selective demolition work to the Owner for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.

1. Provide detailed and/or anticipated daily sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
2. Coordinate with Owner's continuing occupation of building.
3. Coordinate with Owner's representative, the location of equipment and dumpster facilities.
4. Prior to start of demolition at any roof area, confirm with the Owner, any and all, obsolete equipment that has been identified for proper removal/disposal, roof deck treatments and required roof installation.

C. Photographs of existing conditions of structure surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal operations is required. File with Owner prior to start of work.

1.4 JOB CONDITIONS

A. Occupancy: Owner will occupy the building during the selective demolition. The Owner's normal working hours are Monday through Friday, 7:00 AM until 5:00 PM.

B. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of seventy-two (72) hours advance notice to Owner of demolition activities that will affect Owner's normal operations.

C. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

1. Storage or sale of removed items on site will not be permitted.

D. Protections: Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to selective demolition work.

1. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to occupied building.
2. Erect temporary covered passageways as required by authorities having jurisdiction.
3. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.
4. Protect floors with suitable coverings when necessary.
5. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.
6. Remove protections at completion of work.

E. Damages: Promptly repair damages caused to adjacent facilities by demolition work.

F. Traffic: Conduct selective demolition operations and debris removal to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

1. Do not close, block, or otherwise obstruct streets, walks, parking spaces or other occupied areas or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

G. Flame Cutting: Use of cutting torches for removal is not permitted.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of areas to be demolished and adjacent facilities to remain.

1. Cease operations and notify Owner immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
2. Cover and protect furniture, equipment, fixtures and products from soilage or damage when demolition work is performed in areas where such items have not been removed.
3. Daily protection of the Owner's stored products will be required throughout the entire project.

3.2 DEMOLITION

A. General: Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.

B. Remove and replace existing cellular steel decking in a systematic manner. Use such methods as required to complete replacement, install new roofing, and make system watertight in same day. See Section 07220 – Roof Insulation for specific deck repair and replacement guidelines prior to insulation replacement.

C. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner in written, accurate detail. Pending receipt of directive from the Owner, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.

3.3 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove from building site, debris, rubbish and other materials resulting from demolition operations. Transport and legally dispose of all debris off site.

1. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.
2. Burning of removed materials is not permitted on project site.

3.4 CLEANUP AND REPAIR

A. General: Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior as clean as they were prior to demolition procedures.

1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start of operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION 024116

SECTION 061053 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to work of this Section.

1.2 STANDARD REFERENCES

A. References:

1. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used).

American Forest and Paper Association (AFPA)
American Plywood Association (APA)
American Wood Preservative Association (AWPA)
U.S. Dept. Of Commerce Voluntary Product Standards (PS)

1.3 SUMMARY

A. This Section includes the following:

1. Installation of wood blocking and nailers for roofing as shown on drawings.
2. Existing wood blocking shall remain in-place unless deteriorated and requiring replacement.
3. New wood blocking will be used at all locations requiring replacement and all locations requiring additional blocking to match the new roof insulation height.
4. Where required by code and/or the specifications, fire-treated wood materials shall be used.

1.4 DEFINITIONS

A. Rough carpentry includes carpentry work not specified as part of other Sections and generally not exposed, unless otherwise specified.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and specification sections.

B. Submit data indicating fire-treatment of wood and plywood, in accordance with ASTM D 5516 and ASTM D 5664.

1. For each type of treated wood product include certification by treating plant stating type of solution and pressure process used, and compliance with applicable standards.
2. For water-borne treated products included statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site.

C. Submit manufacturer's instructions for handling, storing, installation, and finishing of treated

material.

D. Product Data: submit technical data on all fasteners required for work under this section. Data shall include all required load capacities.

E. Product Sample's: One sample of all fasteners required for work under this section.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels. Provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1. For lumber pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

1.7 JOB CONDITIONS

A. All methods employed in performing the work, and all equipment, tools, and machinery used for handling materials and executing any part of the work, shall be subject to the approval of the Owner before the work is started, and whenever found unsatisfactory, shall be changed and improved as required.

B. Time delivery and installation of carpentry to avoid delaying other operations whose work is dependent on or affected by the carpentry work, and to comply with protection and storage requirements.

C. Protect installed carpentry from damage due to other work activities and weather.

D. Select anchors for attachment of carpentry suitable for structural roof substrate.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Moisture Content: Solid wood, preservative treated, shall be kiln-dried to an amount not to exceed 15%.

B. Grade and Trademark: Grade and trademark shall be on each piece of lumber (or bundle in bundles stock). Use only recognized official markings of Association under whose rules it is graded.

C. Quality: Lumber shall be sound, thoroughly seasoned, well manufactured, and free from warp that cannot be corrected in the process of bridging, bolting or nailing.

1. Lumber shall comply with PS 20-70 and shall be identified with grade mark.

D. Grades and Species of Solid Wood:

1. Blocking and nailers shall be No. 2 Southern yellow pine unless otherwise noted on drawings.
2. Wood sleepers shall be No. 2 Southern yellow pine, size as determined by job conditions.
3. Wood shims shall be exterior grade plywood (exterior grade glue) with a maximum thickness of ½".
4. Plywood sheathing for walls, if needed, shall be APA rated, exposure 1, CDX plywood, comprised of a minimum of four (4) plies, size as determined by job conditions, unless otherwise specified and/or indicated on project drawings.

E. Fire Retardant Treatment: (Dricon or approved equal)

1. Fire-retardant chemical provides protection against termites and fungal decay and must be registered for use as a wood preservative by the U.S. Environmental Protection Agency.
2. All fire-retardant wood must have a flame spread of less than 25 when tested in an extended 30-minute tunnel test in accordance with ASTM E-84, NFPA 255 or UL 723.
3. All fire-retardant wood must be kiln-dried to a maximum moisture content of 19 percent after treatment. All plywood must be kiln-dried to a maximum moisture content of 15 percent after treatment.
4. All fire-retardant wood must comply with the requirements in AWPA Standard C-20 for lumber and C-27 for plywood.
5. Carbon steel, galvanized steel, aluminum, copper and red brass in contact with the fire-retardant treated wood must exhibit corrosion rates of less than one mil per year when treated in accordance with Federal Specification MIL-L-19140 Paragraph 4.6.5.2.
6. Fire-retardant chemicals used to treat the lumber must be free of halogens, sulfates and ammonium phosphate.
7. Testing on the fire performance, strength and corrosive properties of the fire-retardant treated wood shall be recognized by issuance of a National Evaluation Services Report.

2.2 ACCESSORIES

A. Nails: Shall be double hot-dipped galvanized or stainless steel (series 304) annular nails, size as required by construction, with a minimum embedment of one (1) inch or through nailer if dimension is less.

B. Fasteners: All fasteners shall be corrosion resistant stainless steel or heavy-duty fluorocarbon coated steel unless otherwise note, to meet/exceed Factory Mutual Standard 4470 (current edition). Note: Fastener materials shall be compatible with contact materials.

1. Wood Nailers to Concrete: Rawl-Spike, 1/4" diameter with minimum embedment of 1-1/4" as manufactured by Rawl Plug Co., Inc. or approved equal.
2. Wood Nailer to Metal Deck: #10-14 Stainless Steel (Series 300) or fluorocarbon coated steel screw fastener with a minimum head diameter of .400". Penetration of .5" minimum and 1" maximum through high flute of structural steel deck. Maximum spacing shall be no greater than 12" on center.
3. Use of power-actuated nails for blocking or nailers to concrete is unacceptable.
4. Acceptable manufacturers are Construction Fasteners, Inc., SFS, Trufast, Olympic and Rawl.
5. Conduct pull out test with results showing compliance with specifications.

2.3 REJECTED MATERIALS

A. The Owner shall have the right to inspect all materials brought to or stored at the job site. Those materials, which do not comply with the above requirements shall be removed from the Owner's premises within four (4) hours of verbal notification to the person designated by the Contractor to be the lead on site supervisor. The verbal notification will be followed up with written confirmation.

PART 3 - EXECUTION

3.1 PREPARATION

A. Installer must examine the substrates and supporting structure and the conditions under which the carpentry work is to be installed. Notify the Owner in writing of conditions detrimental to the work.

B. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate the work with a minimum of joints or the optimum jointing arrangement.

3.2 INSTALLATION

A. General:

1. Fit carpentry work to other work. Scribe and cope as required for accurate fit.
2. Set carpentry work accurately to required levels and lines with members plumb and true.
3. Securely attach carpentry work to substrates by anchoring and fastening as specified and as required by applicable building codes.
    a. Provide washers under bolt heads and nuts in contact with wood.
    b. Countersink fastener heads where detailed on drawings, or where required by subsequent application of flashing materials.
4. Fasteners: Make tight connections between members. Install fasteners without splitting wood. If wood rides up threading prior to penetrating the structural deck, pre-drill the blocking with a 9/64" drill bit. Where required, use washers and countersink into wood member. Tighten bolts and lag screws at installation and re-tighten as required for tight connections prior to closing in or at completion of work. A minimum of two (2) fasteners shall be utilized per section of wood, regardless of length. Pull out resistance must be a minimum of 360 lbs. per fastener.

B. Blocking, Nailers, Framing and Curbs:

1. New wood nailers shall be added at appropriate roof perimeters, curbs, and similar penetrations. All nailers shall be of sufficient thickness so as to be flush with the insulation/membrane interface and securely anchored to resist a force to 175 lbs./linear foot in any direction. Nailers shall not be lower than the insulation's membrane interface.
2. Install new nailers with 1/8" gap between each length or as required on climatic conditions at the time of installation.
3. Wood nailers, blocking, etc. shall be chambered, beveled, shaved, planed, or shimmed as necessary to provide smooth transition to adjacent materials.

4. New wood shims, where used for providing transition to insulation, shall be pressure treated. Shims are only acceptable in conditions where shim thickness does not exceed 1/2″. All shim material to be in compliance with this Specification. All shims must be continuous and shall be placed at deck level.

C. Existing Nailers:

1. All existing nailers are to be left in-place unless deteriorated. If deteriorated nailers are found, proper removal and replacement shall be required to accommodate the new roof system installation.

3.3 WORKMANSHIP

A. Work which does not conform to the specified requirements including tolerances and finishes, shall be corrected and/or replaced, as directed by the Owner, at the Contractor's expense, without extension of time. Therefore, Contractor shall also be responsible for cost of corrections to any work affected by or resulting from correction to work of this Section.

END OF SECTION 061053

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SECTION 072216 – ROOF INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY

A. This portion of the specification describes materials and workmanship required for the installation of insulation over metal and poured lightweight concrete roof decks.

B. All materials described herein shall be furnished and installed by the roofing contractor unless specifically noted otherwise.

1.3 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Insulation shall be delivered to the site in an undamaged and dry condition. Material received, which is not dry or is otherwise damaged shall be rejected. Material, which becomes wet on site shall be removed and replaced with new material at no additional cost to the Owner.

B. Storage under polyethylene or similar non-breathing film stock shall not be permitted.

C. Proper storage on or off the site shall be the responsibility of the roofing contractor.

D. Any unused insulation remaining on the roof at the end of the workday shall be returned to storage.

1.4 INSULATION - GENERAL

A. Insulation boards shall be full size except when cutting is required at roof edges and openings. Boards that are broken, cracked, have been exposed to moisture, or are otherwise damaged shall not be used.

B. The proper installation and fit of wood nailers, blocking, and other rough carpentry in appropriate locations shall be verified prior to installation of roof insulation.

C. Caution shall be exercised with construction traffic to avoid damage to new insulation. Breaking or crushing of insulation is unacceptable and any damaged insulation shall be replaced at the roofing contractor's expense.

D. Insulation shall be laid with end joints staggered and all joints tight; however, boards shall not be forced into place.

E. No more insulation shall be applied during any work period than can be covered by all plies of roofing during the same work period. At the end of the work period, temporary edge seals shall be installed to protect the roof insulation. Upon resumption of work, they must be removed. Such seals shall consist of strips of roofing felt applied and topcoated with asphalt mastic.

F. Insulation surfaces shall be cleared of all debris before roofing is placed.

1.5 SUBMITTALS

A. General: Submit each item according to the Conditions of the Contract and Division 1 Specifications.

B. Product data and samples for each type of insulation, fastener and component.

C. Shop Drawings showing tapered insulation layout and cross sections.

PART 2 - PRODUCTS

2.1 INSULATION

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into Work include, but are not limited to, the following:

1. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class I, Grade 3 – as accepted and approved by the membrane manufacturer for systems warranty.
2. Non-Vented Composite Panel: Panels shall consist of a top layer of APA rated 5/8" Plywood and a bottom layer of black fiber reinforced faced polyisocyanurate foam insulation. Polyisocyanurate foam insulation shall conform to ASTM C 1289, Type II, Grade 3 by Hunter Panels or equal.
3. Cover Board (as accepted by the membrane manufacturer for systems warranty):
    a. Georgia Pacific – ½ inch DensDeck Prime
    b. USG Corporation – ½ inch Securock
    c. Johns Manville – ½ inch Duraboard
    d. Equal approved in advance by the Owner
    e. Provide products that comply with the following limits for surface burning characteristics when tested per ASTM E84
        i. Flame spread: 25, maximum.
        ii. Smoke developed: 450, maximum.

B. Materials:

1. First Insulation Layer at Roof Area A-1 (Base Bid & Alternate #1) :
    a. Type: Polyisocyanurate.
    b. Thickness: 2 inches minimum. Contractor to verify thickness and layout of insulation required prior to ordering.
2. Non-Vented Composite Panels at Roof Area A-1 (Base Bid):
    a. Type: Plywood/polyisocyanurate composite panel.
    b. Thickness: 3.5 inches minimum. Contractor to verify thickness and layout of insulation required prior to ordering.
    c. Panel with wood substrate as specified shall be factory rabbetted 1/8 inch (3.2 mm) on all sides to prove for expansion of substrate.
    d. Only factory assembled panels will be accepted.

3. Second Layer at Roof Area A-1 (Alternate #1):
   a. Type: Polyisocyanurate.
   b. Thickness: 2 inches minimum. Contractor to verify thickness and layout of insulation required prior to ordering.
4. Tapered Layers at Roof Areas A (Base Bid) and B thru G (Alternate #2):
   a. Type: Polyisocyanurate.
   b. Thickness: 1/2 inch minimum – overall thickness varies. Contractor to verify thickness and layout of insulation required prior to ordering.
5. Fill insulation (for tapered insulation):
   a. Type: Polyisocyanurate.
   b. Thickness: Equal to surrounding insulation.
6. Top Layer (cover board) at Roof Areas A (Base Bid), A-1 (Alternate #1), and B thru G (Alternate #2):
   a. Type: Water-resistant gypsum based cover board.
   b. Thickness: 1/2 inch minimum thickness.
   c. The cover board must be installed after crickets and drain sumps (if any).
7. Tapered edge strip: ASTM C728-82, perlite, tapered from 1-1/2 inch to 1/8 inch (on twelve inch dimension), size 12 x 48 inches or as approved by the manufacturer's representative.
8. Cants: ASTM C728-82, perlite or fiberboard as approved by roof system manufacturer.
9. Crickets: ASTM C728-82, perlite, factory fabricated, 1/4 inch slope, 2 x 4 feet dimension.

C. All insulation materials must be approved by the manufacturer of primary roof materials. Samples should be provided by the manufacturer and written approval from the manufacturer of primary roof materials is required prior to ordering these materials for the project.

2.2 MECHANICAL ATTACHMENT OF ROOF INSULATION

A. Mechanical fasteners shall be used to secure the initial layer of insulation on the metal roof deck areas at Roof Areas A (Base Bid) and B thru G (Alternate #2).

1. The base layer of insulation at Roof Area A-1 shall be loose laid and fastened with the subsequent composite board attachment.

B. Approved fasteners:

1. Roofgrip screw with Climaseal coating; plastic disc or metal plate - Buildex Div. of ITW, Itasca, IL.
2. Dekfast screw with Climaseal coating; plastic disc or metal plate - Buildex Div. of ITW, Itasca, IL.
3. Dekfast screw with Sentri coating; plastic disc or metal plate - Construction Fasteners, Inc., Wyomissing, PA.
4. From Fabco Fastening System, West Newton, PA.: Insul-Fixx screw with Fabcote coating; plastic disc or metal plate or Plate-Fixx screw with Fabcote coating; plastic disc.
5. Kwik-Deck screw with Oxyseal coating; plastic disc or metal plate - Atlas Bolt & Screw Div., Trans Union Fastener Corp., Ashland, OH.
6. Olympic #12-11 Standard Steel Deck Screw or #14-10 Heavy Duty All Purpose Screw with

CR-10 coating; three inch diameter plastic or metal disc - Olympic Manufacturing Group, Inc., Agawam, MA.

7. Perma Fastener screw with Permaseal coating; metal plate - International Permalite, Inc., Oak Brook, IL.
8. Or as approved and accepted by the primary roof system manufacturer.

C. Screw Length: Sufficient to engage steel deck by minimum 3/4 inch.

D. Pull-out Testing of Fasteners: The selected contractor shall perform pull-out testing for each type of fastener to verify that the proposed fasteners meet the required withdrawal resistance in the existing steel and wood plank roof deck type.

1. Testing shall be performed in accordance with ANSI/SPRI FX-1-2001 (Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners). Record results of all pull-out tests and provide a copy to the Architect.

2.3 SECUREMENT FOR TAPERED INSULATION AND COVER BOARD

A. Cold Process Adhesive: Low rise foam insulation adhesive provided and approved by the selected roof membrane manufacturer.

1. Cold process adhesive shall be used to secure insulation over initial base layer of insulation.

2.4 VAPOR BARRIER

A. Rubberized Asphalt Underlayment: Cold applied, self-adhering, 40 mils thick sheet consisting of slip-resisting polyethylene film reinforcing and top surface laminated to rubberized asphalt adhesive, with release-paper backing in accordance with ASTM D 1970.

1. Surface primer/conditioner shall be a product as provided and approved by the underlayment manufacturer for the existing deck material.

2. Acceptable Manufacturers and Products:
   a. Henry Co. – “Blueskin PT200HT”
   b. Carlisle Coatings & Waterproofing Inc. – ‘CCW-705 HT”
   c. Polyguard Products, Inc. – “Deck Guard”
   d. Firestone Building Products – “V-Force”
   e. or approved equal.

PART 3 - EXECUTION

3.1 CONDITION OF DECK

A. Prior to installing underlayments and/or insulation, roof deck must be inspected and all deficiencies corrected.

B. The roofing contractor shall perform all other work of preparing the deck. When insulation is applied, the deck shall be dry and free of dew, frost, ice, and snow.

C. The roofing contractor shall notify the Owner and Architect of any improper installations.

D. Fill all holes in roof deck including burn holes at weld locations on metal deck roof areas.

3.2 METAL DECK PREPARATION AND CORRECTION, IF REQUIRED

A. On a daily basis when the exiting roof is being removed, inspect exposed areas of metal roof deck surface for condition and suitability to receive the new roof assembly. If corroded or damaged areas of metal decking exist, immediately notify the Owner's project manager.

B. If the metal deck has been structurally impaired; the following steps shall be taken:

1. Examine the underside of the metal deck for any conduit located directly below the deck surface, anything suspended or fastened to the deck, etc. If necessary, detach all objects from the bottom side of the deck to be removed.
2. Remove the corroded metal deck using a Sawzall to prevent sparks. Care must be taken to prevent metal deck sections from falling into the building.
3. Fasten new cellular metal deck of the same gauge, configuration and profile to the existing structure. New metal panels shall be the same length and span as the existing panel being replaced and shall match existing bearing. Fasten every deck flute at the beam using self-tapping hex head washer screws. Fasten perimeter side laps at midpoint of joist spacing (maximum every 36" o.c.) using self-tapping hex head washer screws. Welding of the replacement metal deck will not be allowed. The contractor must provide an interior spotter with cellular phone or radio device to communicate with roof top personnel during all roof deck replacement.

C. Verify that the metal deck is now suitable to receive the specified roof system.

D. Deck Cleaning and Painting: At areas of moderate corrosion development, the existing metal decking may require wire brushing, cleaning and painting. Wire brush, properly clean and paint areas of corroded roof decking with Sherwin Williams B66W1 DTM.

E. The Owner's representative and the contractor's on site project superintendent shall make the determination of areas of deck replacement, deck cleaning and painting and deck overlay installation. The Contractor's representative shall keep a daily log and running total of the above items with daily signatures being obtained from the Owner's project manager.

3.3 VAPOR BARRIER INSTALLATION (at Roof Area A-1)

A. Prime surface of existing steel decking as recommended and required by the vapor barrier membrane manufacturer.

B. Install vapor barrier to entire substrate in accordance with the manufacturer's instructions for installation. Apply wrinkle free, in shingle fashion to shed water with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Center laps over the top surface of the metal deck flutes and roll laps with roller.

3.4 PITCH DAMS AT MODIFIED BITUMEN MEMBRNANE ROOFING

A. Before placing second layer of insulation and/or setting cant strips, a strip of type IV fiberglass roofing felt, 12 inches wide shall be applied in all corners and along all vertical surfaces. The strip shall be applied in a 1/16 inch thick application of asphalt roof cement and shall extend out on the

insulation 6 inches from the corner. Similarly apply felt pitch dams at all roof openings.

B. Apply pitch dams at all roof edges as detailed on drawings.

C. At low gravel stops, approximately 1/2 width of the felt strip shall hang over the edge until after roofing plies have been applied, after which the strip shall be folded back on top of the roofing and secured with asphalt roof cement.

D. It is intended that pitch dams be installed at all locations where there is a possibility of cold process adhesive drippage into the area below or down exterior walls.

E. The roofing contractor shall notify the Owner of any improper installations.

3.5 THERMAL INSULATION

A. Installation of insulation and composite board at Roof Area A-1.

1. Install base layer of 1.5 inch polyisocyanurate insulation loose laid to the existing metal deck.
2. Install non-vented composite panels with the plywood side face up. Place panels in the manufacturer's written recommended pattern. Fasten the panels through the panel spacers using manufacturer's approved threaded fasteners.
3. Coordinate thickness of composite panels to provide flush surface for underlayment and metal roof attachment.

B. Installation of first layer, mechanically attached at Roof Areas A and B thru G.

1. Lay new 2 inch polyisocyanurate insulation in place and mechanically attach to the roof deck. Fastener density: One every two (2) sq. ft. or as required by the roof system manufacturer to meet 90 mile per hour wind uplift requirements.
2. Install additional fasteners (if required) to ensure insulation is firm under foot.
3. Drive mechanical fasteners flush to top surface. Bottom layer shall form continuous insulation joints over metal deck flange.
4. Do not cantilever insulation edges over metal deck ribs. Minimum bearing surface: 1-1/2 inches.
5. Lay insulation in 48 inch wide courses.

C. Installation of tapered insulation and cover board, adhered at Roof Areas A and B thru G:

1. Offset joints of intermediate and/or top layer 6 inches minimum in both directions from joints of base layer.
2. Adhere to previously installed first or intermediate layer using roof membrane manufacturers low rise foam insulation adhesive or equal approved by the Owner or as required by the roof system.
3. Walk insulation boards to insure full and proper adhesion to base layer.

D. Other insulation installation requirements:

1. Stagger joints within layers at least 6 inches.
2. Install insulation boards in courses parallel to roof edges, mopping surface up.
3. Firmly butt each insulation board to surrounding boards. Do not jam or deform boards.

4. Maximum insulation gap: 1/4 inch. Fill insulation board joint gaps larger than 1/4 inch with roof insulation.
5. Maximum elevation variation between boards at joints: 1/8 inch.
6. Maximum insulation board size for insulation adhered with hot asphalt shall be 4 foot x 4 foot.
7. Cut and fit insulation boards where roof deck intersects vertical surfaces. Cut board 1/4 inch from vertical surface.
8. Filler insulation requires two (2) fasteners per piece minimum. Filler size: 18 inches in length or width, minimum.
9. Provide fully tapered sumps at all drain locations.

3.6 TAPERED EDGE INSTALLATION

A. Tapered edge strips shall be adhered with the selected roof membrane manufacturer's cold process insulation adhesive.

B. Tapered edge strips must be installed at all required locations prior to application of modified membrane roofing plies.

C. Tapered edge strips shall be used at low perimeter roof edges where nailer and gravel stop is raised as detailed.

3.7 CRICKET INSTALLATION

A. Tapered crickets shall be adhered with the selected roof membrane manufacturer's cold process insulation adhesive

B. Crickets are to be installed at all locations shown on the drawings to promote positive drainage.

C. All crickets must be installed prior to application of modified membrane roofing plies.

3.8 CANTS

A. Perlite or fiber cant strips shall be installed at all 45 degree angles where the horizontal installation of insulation meets the vertical sides of roof penetrations and walls. Cants must be installed prior to application of modified membrane roofing plies and flashings.

END OF SECTION 072216

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SECTION 074113 - PREFORMED METAL ROOF PANELS

PART 1 – GENERAL

1.1 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
   a. ASTM A653, "Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated by the Hot-Dip Process," American Society for Testing and Materials, 1998.
   b. ASTM E1592, "Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference," American Society for Testing and Materials, 1995.
   c. ASTM E1646, "Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference," American Society for Testing and Materials, 1995.
   d. ASTM E1680, "Test Method for Rate of Air Leakage through Exterior Metal Roof Panels Systems," American Society for Testing and Materials, 1995.UNDERWRITERS LABORATORIES, INC. (UL)
2. UNDERWRITERS LABORATORY (UL)
   a. UL 580, "Tests for Uplift Resistance of Roof Assemblies," Underwriter's Laboratories, Inc., 1994.
   b. UL 2218 "Impact Resistance of Prepared Roof Covering Materials"

1.2 DESCRIPTION OF WORK

A. Extent of pre-formed metal roofing is shown on the Drawings. All of the new metal roof installation shall be part of the Base Bid work.

B. Type of preformed roofing specified in this section includes Architectural Standing Seam Roof Covering.

C. Metal trim, metal flashing, metal accessories used in conjunction with the metal roofing.

D. All materials of the covering and trim envelope, including any custom shapes, to be as engineered and manufactured by a sole entity accepting the responsibility of compliance to these specifications.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Standing seam roof systems shall be designed by the manufacturer as a complete system. All components of the system shall be supplied or specified by the same manufacturer.

B. Design loads applications shall be in accordance with ASCE-7, current version, and as required by applicable codes.

C. Roof panels shall be free to move in response to the expansion and contraction forces resulting from temperature variations as specified in the MBMA Metal Roofing Systems Design Manual.

D. Provide roofing material which has been tested and listed by the Underwriters Laboratories, Inc. to have a Wind Uplift Classification of Class 90.

E. Metal roofing systems shall be tested in accordance with Underwriters Laboratories, Inc. (UL) Test Method 580 "Tests for Uplift Resistance of Roof Assemblies," Class 90 rating.

F. Metal roof panel systems shall be tested in accordance with ASTM E1592-95 for negative loading. Capacity for gauge, span, or loading other than those tested may be determined by interpolating between test values only.

G. Metal roof panel systems shall have a maximum air infiltration rate of 0.007 cfm/ft2 at a pressure differential of 6.24 psf. when tested in accordance with ASTM E1680-95.

H. Metal roof panel systems shall have no uncontrollable water leakage at a pressure differential of 2.86 psf. when tested in accordance with ASTM E1646-95.

I. Metal roofing systems shall be tested in accordance with Underwriters Laboratories, Inc. (UL) Test Method UL2218 - "Impact Resistance of Prepared Roof Covering Materials" Class 4.

1.4 SUBMITTALS

A. Shop Drawings are required for this Section and shall be coordinated with shop drawings for related trades by the Roofing Contractor and/or Owner.

B. Submit information from the manufacturer indicating the clip spacing required, clip fastener type, and fastener spacing at fixed attachment points and any areas of exposed fastening. Submit testing on system to indicate fastening requirements for attachment to plywood deck in compliance with applicable codes and loading.

B. Submit available colors for selection. Provide manufacturer's full range of colors - colors may be non-standard. Include actual color coated metal chips and standard printed charts.

C. Submit Manufacturer's twenty (20) year weathertight and finish warranties and Contractor's 2 year watertightness guarantee to include all system panels, system components and accessories and covering weather-tightness, materials, labor and workmanship.

D. Product data including product specifications, standard details, performance data and general recommendations.

1.5 WARRANTIES

A. Manufacturer's Material/Finish Warranty: Twenty (20) year, non-prorated finish warranty covering integrity of finish on roof panels, siding and trim coatings relative to perforation, chalking, fading and other entities.

B. Manufacturer's Weathertight Warranty: Twenty (20) year, no dollar limit, weathertight warranty to include all system panels, system components and accessories and covering weather-tightness, materials, labor and workmanship.

C Contractor's Roofing Guarantee: The contractor shall submit a written guarantee in which he agrees to maintain the entire roof system(s) in a completely watertight condition at no cost to the Owner for two (2) years from the date of final acceptance.

1.6 MANUFACTURER'S QUALIFICATIONS:

A. Manufacturer shall have a minimum of ten (10) years experience in manufacturing metal roofing systems. Panels specified in this section shall be produced in a permanent factory environment with fixed-base roll forming equipment. A letter certifying the manufacturer's qualifications shall accompany the product material submittals.

1.7 INSTALLER'S REQUIREMENTS

A. The Installer shall meet the following minimum criteria:

1. Have received training and licensing from the metal roofing manufacturer for the installation of the specified roof system.
2. A letter certifying the installer as the Manufacturer's Certified Installer shall accompany the submittal package.
3. Have installed a minimum of five (5) metal roof system installations similar to this Project. Contractor shall provide a list of projects along with contacts for each job.
4. Contractor's on-site supervisor shall have a minimum of five (5) metal roof system installations similar to this Project. All crew personnel shall have a minimum of three (3) metal roof system installations similar to this Project.

PART 2 - PRODUCTS

2.1 PRODUCT HANDLING

A. Deliver and store material to avoid damage to the material or finish. Deliver metal roofing system to job site properly packaged to provide protection against transportation damage.

B. Exercise extreme care in unloading, storing, and installing metal roofing system to prevent bending, warping, twisting, and surface damage.

C. Do not store materials on roof decks, nor position roofing installation equipment on roof decks, in concentrations exceeding the design Live Load.

D. Store all material and accessories above ground on well-supported platforms that provide a minimum of 1/4 to 12 of slope. Store materials under waterproof covering or indoors and provide proper ventilation of metal roofing system to prevent condensation build-up between each panel, trim or flashing component.

2.2 PANEL MATERIALS

A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755.

1. Aluminum-Zinc Alloy Coated Steel Sheet: ASTM A 792, Class AZ50 coating designation, Grade 40; structural quality.
2. Surface: Smooth finish (to match existing metal roofing system on site).
3. Exposed Coil-Coated Finish:
    a. 2-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing 70 percent PVDF resin by weight in color coat. Prepare, pre-treat, and apply coating to exposed metal surfaces per coating and resin manufacturers' written instructions.
4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.
5. Color selection of panels shall be from Manufacturer’s full range of colors.
6. Provide factory applied strippable plastic film for protection during fabrication and installation. Protective film must be removed immediately after installation.

B. Panel Sealants & Closures:

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sagging, non-toxic, non-staining tape sealant approved by the panel manufacturer.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.
4. Closures shall be a closed cell foam material of a gray or neutral color die cut to panel or die-stamped and fabricated metal matching the adjacent panel material and finish as detailed on the drawings for special conditions. Manufacturer’s standards will be considered where appropriate only.

2.3 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation. Comply with ASTM E 1514.

B. Vertical-Rib, Interlocking Seam, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and mechanically seaming panels together with a double-lock (180 degree) seam.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Firestone Building Products, UC-6 Double Lock Standing Seam
    b. Butler, VSR Panel System

c. AEP Span, Span Seam System
d. or Equal

2. Clips: Stainless steel, concealed type to accommodate thermal movement.
3. Panel Coverage: 16 inches
4. Panel Seam Height: 2 Inches.
5. Color: To match existing panels on site as closely as possible. Provide manufacturer's full range of colors for color selection.

2.4 FASTENERS

A. Fasteners for panel clips shall be type and size as approved for the applicable requirements and shall be per the manufacturer's requirements to meet applicable loading.

B. Exposed roof fasteners shall be sealed or have sealed washers on the exterior side of the covering to waterproof the fastener penetration. Washer material shall be compatible with the screw head; have a minimum diameter of 3/8-inch for structural connections; and gasket portion of fasteners or washers shall be EPDM, neoprene or other equally durable elastomeric material.

C. Exposed fasteners must be kept to a minimum. If exposed, fastener color must match panel, trim, or accessories.

2.5 ACCESSORIES

A. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fascias, corner units, ridge/hip closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as roof panels.
2. Closure Strips: Closed-cell, expanded, cellular, rubber or cross linked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or pre-molded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

B. Flashing and Trim: Formed from same material as roof panels, pre-painted with coil coating, minimum 0.018 inch thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges/hips, fascias, and fillers. Provide cladding of exposed vent pipes and equipment curbs in field of metal roofing. Finish flashing and trim with same finish system as adjacent metal roof panels, unless noted otherwise.

C. Pipe flashings shall be a one piece EPDM (ethylene propylene diene monomer) molded rubber boot having a serviceable temperature range of -65°F to 212°F (for standard applications) or silicone molded rubber boot having a serviceable temperature range of -100°F to 437°F (for high temperature applications) and shall be resistant to ozone and ultraviolet rays. Units shall have an aluminum flanged base ring. Do not install pipe flashings through any panel seams - install ONLY in the flat portion of the panel.

1. Roof jacks shall be provided in a color to match the existing metal roofing as closely as possible. Color shall be approved by the Owner prior to installation.

2.6 UNDERLAYMENTS

A. Waterproof Membrane: Self adhering rubberized sheet membrane with resistance to direct exposure for at least forty (40) days. Minimum high temperature resistance of 230 degrees Fahrenheit. Maximum water vapor permeance of 0.1 perms.

B. Underlayment Sheet: Synthetic, non-adhering, UV stabilized roof underlayment to serve as a separator between the self adhering sheet and the metal roof panel. Underlayment sheet shall have a minimum exposure time of six months, shall have a skid resistant surface, and shall be approved by the metal roof panel system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

C. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.

D. Install vapor barrier and composite plywood/polyisocyanurate panels in accordance with Section 07220 – Roof Insulation.

E. Examine composite plywood/polyisocyanurate panel substrate to verify that installation is within flatness tolerances required by metal roof panel manufacturer.

F. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to underlayments, including removing projections capable of interfering with underlayment attachment.

B. Install furring, blocking and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written instructions.

C. Install a full sheet of self-adhering ice and water shield along entire lengths of all valleys, ridges and rake edges and around all penetrations. Overlap ends at least 4 inches least 4 inches; stagger end laps at least 36 inches apart.

D. Starting at the lowest point of the roof section, apply one layer underlayment horizontally over all sections of roof deck and mechanically attach in place. Lap the horizontal edges at 2 inches. Overlap ends at least 4 inches least 4 inches; stagger end laps at least 36 inches apart.

3.3 METAL ROOF PANEL INSTALLATION

A. Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.

B. Thermal Movement. Rigidly fasten metal roof panels to structure at one and only one end location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction. Pre-drill panels for fasteners.

1. Point of Fixity: Unless indicated otherwise, rigidly fasten ridge end of metal roof panels and allow cleated eave end free movement due to thermal expansion and contraction.
2. Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.

C. Install metal roof panels as follows:

1. Commence metal roof panel installation and install minimum of 300 sq. ft. in presence of factory-authorized representative.
2. Field cutting of metal panels by torch is not permitted.
3. Locate and space fastenings in uniform vertical and horizontal alignment.
4. Provide metal closures at rake edges, rake walls and each side of ridge and hip caps.
5. Flash and seal panels with weather closures at eaves, rakes, and perimeter of all openings.
6. Install hip caps as metal roof panel work proceeds.
7. Install metal flashing to allow moisture to run over and off metal roof panels.

D. Penetrations: Do not place pipe penetrations through the panel seams or hips. Relocate existing penetrations as required to penetrate the pan of the panel.

E. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

1. Coat back side of roof panels with bituminous coating where roof panels will contact wood, ferrous metal, or cementituous construction.

F. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.

1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.
2. Prepare joints and apply sealants per requirements of the chosen manufacturer.

G. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.

1. Install clips to substrate with approved fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seaming tool so clip, metal roof panel, and factory-applied sealant are completely engaged.

3.4 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly including trim, ridge closures, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

C. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.

C. Repair panels with minor damage with finish touch-up paint. Repair materials and touch-up paint shall be as supplied by the panel manufacturer and shall be installed in accordance with the manufacturer's written requirements.

D. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113

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SECTION 075216 – COLD PROCESS SBS MODIFIED BITUMEN MEMBRANE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Technical Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Deck Preparation
2. Roofing Insulation
3. Modified Bitumen Roof Membrane
4. Base Flashing

B. Related Sections include the following:

1. Section 06100 - Rough Carpentry
2. Section 07220 - Roof Insulation
3. Section 07620 - Flashing and Sheet Metal
4. Section 07920 - Sealants and Caulking

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 for definitions of terms related to roofing work not otherwise defined in this Section.

B. Cold Application Adhesive: A generic term used in this Section to include adhesive used for installation of Modified Bitumen Membrane roofing applications.

C. Hot Air Welded Seams: A term used for the method used to adhere the roof Modified Bitumen Membrane seams together.

D. Thermal Resistivity: When thermal resistivity properties of insulating materials are designed by R-values, they represent the reciprocal of thermal conductivity (K-value). Thermal conductivity is the rate of heat through a homogenous material exactly 1 inch thick. Thermal resistivity (R-value) is expressed by the temperature difference in degrees F between two parallel surfaces required to cause 1 Btu to flow through 1 sq. ft. of a homogenous material exactly 1 inch thick per hour at the mean temperature indicated.

E. Thermal Resistance: Where thermal resistance properties of insulating materials are designated by R-values, they represent the reciprocal of thermal conductance (C-value). Thermal conductance is the rate of heat flow through a material of the thickness indicated. Thermal resistance (R-value) is expressed by the temperature difference in degrees F between the two exposed faces required to cause 1 Btu to flow through 1 sq. ft. per hour at the mean temperature indicated.

1.4 PERFORMANCE REQUIREMENTS

A. General: Install a watertight, 2 ply modified bitumen membrane roofing system and base flashing system with compatible components that will not permit the passage of liquid water and will withstand wind loads, thermally induced movement, and exposure to weather without failure and as specified herein.

B. FM Listing: Provide 2 ply modified roofing, base flashings, and component materials that comply with requirements of FM 4450 and FM 4470 as part of a roofing system and that are listed in FM's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM markings.

1. Roofing system shall comply with a Fire/Windstorm classification of Class 1-90.

C. Environmental Requirements: Provide a modified bitumen membrane cap sheet with a factory applied coating that is Energy Star rated with the following minimum requirements.

1. Highly reflective and emissive roof surface as listed with the CRRC (Cool Roof Rating Council.
   a. Reflectivity: 0.76
   b. Emissivity: 0.85
   c. SRI (Solar Reflectance): 92

1.5 SUBMITTALS

A. Product Data: For each type of roofing product specified. Include data substantiating that materials comply with requirements.

B. Shop Drawings: Include plans, sections, details, and attachments to other work, for the following:

1. Base flashings, cants, and membrane terminations.
2. Crickets, saddles, and tapered edge strips, including slopes.

C. Samples for Verification: Provide three (3) sets of the following products:

1. 12-by-12 inch square of roofing insulation.
2. 12-by-12 inch square of base sheet modified roofing felt.
3. 12-by-12 inch square of granule surfaced modified cap sheet.
4. 12-by-12 inch square of granule surfaced modified walkway pad.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install specified roofing system, has a minimum 5 years experience installing the specified products and is eligible to receive the specified roofing manufacturer's warranty.

E. Manufacturer Certificates: Signed by roofing system manufacturer certifying that the roofing system complies with ASTM and other requirements specified.

F. Warranty: Sample copy of roofing manufacturer's twenty year (20) No Dollar Limit (NDL) guarantee stating obligations, remedies, limitations, and exclusions of guarantee.

G. Installer's Guarantee: Upon completion of the work, and as a condition of its acceptance, deliver to the Owner a written guarantee signed by the Contractor and the installing subcontractor (if any) agreeing to maintain the roofing, flashings, sheet metal and caulking in a waterproof condition for a period of at least two (2) years following installation, and without any additional cost to the Owner.

H. Inspection Report: Upon completion of the work, and as a condition of its acceptance, deliver to the Owner a written copy of roofing system manufacturer's final inspection report of completed roofing system installation.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an installer to perform Work of this Section who is approved, authorized, or licensed by manufacturer to install specified roofing system, has a minimum 5 years experience installing the specified products and is eligible to receive the specified roofing manufacturer's warranty.

B. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method indicated below by UL, or another testing and inspecting agency acceptable to the Owner. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class A; complying with ASTM E 108, for application and slopes indicated.

C. Pre-construction Conference: Before starting work, conduct conference at project site to comply with requirements of contract documents. Notify participants at least five (5) working days before conference.

1. Meet with Owner; Architect; Owner's insurer; if applicable; testing and inspecting agency representative; roofing installer, including job foreman; roofing system manufacturer's representative; installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Determine loading limitations of roof deck during and after roofing.
4. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
5. Review governing regulations and requirements for insurance, certificates, and inspection and testing, if applicable.
6. Review temporary protection requirements for roofing system during and after installation.
7. Review roof observation and repair procedures after roofing installation.
8. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.
9. Contractor shall document all existing conditions including grounds, parking lots, sidewalks, curbs, exterior walls and the building interior. Documentation shall be photographic or videographic and a copy shall be provided to the Owner prior to the job start.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, warm, well-ventilated, weather tight location according to roofing

system manufacturer's written instructions. Store rolls of roofing base sheet and Modified Bitumen Membrane cap sheet materials on end on pallets or other raised surfaces. Do not double-stack rolls.

1. Handle and store roofing materials and place equipment in a manner to avoid significant or permanent damage to deck or structural supporting members.

B. Do not leave unused roofing base sheet or Modified Bitumen Membrane capsheet materials on the roof overnight or when roofing work is not in progress unless protected from weather and moisture and unless maintained at a temperature exceeding 50 deg F.

C. Deliver and store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.

D. Protect roofing insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation, except where more stringent requirements are specified.

1.8 PROJECT CONDITIONS

A. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1.9 WARRANTY

A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Roofing Manufacturer's No Dollar Limit (NDL) Systems Warranty: Submit a written warranty, without monetary limitation, signed by the roofing system manufacturer agreeing to promptly repair leaks in the roofing system resulting from defects in materials or workmanship and to replace wet/damaged roof areas resulting from such leaks for the following warranty period:

1. Warranty Period: Twenty (20) years, No Dollar Limit, minimum.

C. Submit roofing Installer's warranty, signed by Installer and the Contractor, covering Work of this Section, including membrane roofing, base flashing, roofing insulation, fasteners, and metal counterflashing, for the following warranty period:

1. Warranty Period: Two (2) years from date of Substantial Completion of the entire project.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into Work include, but are not limited to, the following:

1. Modified Bitumen Membrane Roofing:
    a. Soprema Inc.
    b. Siplast
    c. Johns Manville
    d. Firestone Building Products
    e. or Approved Equal

2.2 INSULATION

A. Provide and install in accordance with Section 07220 – Roof Insulation.

2.3 MODIFIED BITUMEN MEMBRANE BASE SHEET

A. Membrane Base Sheet: Modified bitumen sheet, approximately 125 mils in thickness, fiberglass and/or polyester mat, complying with ASTM D 6163, Type II, Grade S, or ASTM D 6164, Type II, Grade S, suitable for the application method specified with a fine mineral applied to both sides of the sheet or equal approved by the Owner.
    1. Application Method: Cold Process Adhesive
        a. Hot Air Welded Seams Shall Be Required

2.4 MODIFIED BITUMEN MEMBRANE CAPSHEET

A. Membrane Cap Sheet: Fire Rated, modified bitumen sheet, approximately 160 mils in thickness, fiberglass and/or polyester mat, complying with ASTM D 6163, Type II, Grade G, or ASTM D 6164, Type II, Grade G, suitable for the application method specified, granule color to be manufacturer's Energy Star Rated white or equal approved by the Owner.
    1. Application Method: Cold Process Adhesive
        a. Hot Air Welded Seams Shall Be Required

2.5 FLASHING MATERIALS

A. Flashing Backer Sheet: Modified bitumen sheet, approximately 125 mils in thickness, fiberglass and/or polyester mat, complying with ASTM D 6163, Type II, Grade S, or ASTM D 6164, Type II, Grade S, suitable for the application method specified with a fine mineral applied to both sides of the sheet or equal approved by the Owner.
    1. Application Method: Cold Process Adhesive
        a. Hot Air Welded Seams Shall Be Required

B. Flashing Sheet: Modified bitumen flashing sheet, approximately 160 mils in thickness, fiberglass and/or polyester mat, complying with ASTM D 6163, Type II, Grade G, or ASTM D 6164, Type II, Grade G, suitable for the application method specified, granule color to be manufacturer's standard white or equal approved by the Owner.
    1. Application Method: Cold Process Adhesive
        a. Hot Air Welded Seams Shall Be Required

2.6 ADHESIVE MATERIALS

A. Asphalt Primer: ASTM D 41.

B. Roof Membrane Adhesive: Roof membrane manufacturer's approved modified asphalt cold process adhesive that meets or exceeds ASTM 3019, Type III, Grade 2 or equal approved by the Owner.

1. Label each container or provide certification directly from the selected roofing membrane manufacturer identifying the type of adhesive to be used.

2.7 AUXILIARY MEMBRANE MATERIALS

A. General: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with cold process modified built-up roofing systems.

1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.

B. Asphalt Roofing Cement: Asbestos free, of consistency required by roofing system manufacturer for application.

C. Metal Termination Bars: Aluminum or galvanized steel bars, approximately 1 inch wide by 1/8 inch thick, predrilled at 8-inch centers.

D. Glass-Fiber Fabric: Woven glass cloth, complying with ASTM D 1668, Type II.

E. Metal Flashing Sheet: Metal flashing sheet is specified in Section 07620 – Flashing and Sheet Metal.

F. Wood Nailer Strips: Furnish wood nailers complying with requirements of Section 06100 – Rough Carpentry.

G. Wood Cants: Furnish wood cants complying with requirements of Section 06100 – Rough Carpentry.

H. Cants: Perlite board, complying with ASTM C 728.

I. Walkway Pads: Modified bitumen sheet, approximately 160 mils in thickness, to match the new capsheet membrane selected for installation and suitable for application method specified, granule color to be manufacturer's standard white.

1. Application Method: Cold Process Adhesive with Hot Air Welded Seams

J. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer for intended use.

2.8 INSULATION MATERIALS

A. General: Provide and install new insulation boards of type, thickness and attachment method indicated in Section 07220 - Roof Insulation shall be selected from the roof membrane manufacturer's standard sizes and of thickness indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions to which roofing will be applied, with Installer present, for compliance with requirements.

B. Verify that roof openings and penetrations are in place and set and properly braced from underneath.

C. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at roof penetrations, roof perimeters and terminations and match the thickness of insulation as required.

D. Do not proceed with subsequent roof system installation if detrimental conditions of the structural roof deck is found.

E. Upon Owner's approval, an interior inspection of the underside of the roof deck should be completed prior to the start of the roof removal and new roof system installation. Document any areas of decking that appear to be deteriorated or damaged and report the same to the Owner's project manager.

F. Proper coordination with the Owner's representative will be required at all times. Daily communication of proposed work areas will be required for the duration of the project.

3.2 METAL DECK PREPARATION AND CORRECTION, IF REQUIRED

A. On a daily basis when the exiting roof is being removed, inspect exposed areas of metal roof deck surface for condition and suitability to receive the new roof assembly. If corroded or damaged areas of metal decking exist, immediately notify the Owner's project manager.

B. Prior to installing insulation, all deteriorated conditions in the existing deck must be corrected. See Section 02070 – Selective Demolition and Section 07220 – Roof Insulation.

C. Metal Decking: Verify that metal decking is structurally sound and properly attached to the supporting bar joist. Metal decking shall be free of rust and/or scale. Do not proceed with subsequent roof system installation if detrimental conditions of the metal decking are found.

3.3 INSULATION & COVER BOARD

A. General: Provide and install new insulation and cover boards of type and thickness indicated that complies with installation requirements of Section 07220 - Roof Insulation, selected from the roof membrane manufacturer's standard sizes and of thickness indicated.

3.4 SUBSTRATE PREPARATION

A. Clean substrate of dust, debris, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging drainage accessories and from spilling or migrating onto surfaces of other construction.

3.5 GENERAL INSTALLATION REQUIREMENTS

A. Install new modified bitumen membrane roofing system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA "Quality Control Guidelines for the Application of Built-up Roofing."

B. If required, start installation of modified bitumen membrane roofing in presence of roofing system manufacturer's technical personnel. Schedule all required in-progress inspections with manufacturer's technical personnel.

C. Cant Strips: Install and secure preformed 45-degree cant strips at junctures of modified bitumen membrane roofing system with vertical surfaces or angle changes greater than 45 degrees.

D. Cooperate with inspecting and testing agencies engaged or required to perform services for installing the new roofing membrane system, including if necessary, test cuts.

E. Coordinate installing roofing system components so insulation and roofing membrane components are not exposed to precipitation or left exposed at the end of the workday or when rain is forecast.

1. Provide cutoffs at end of each day's work to protect completed areas of roofing membranes and insulation with a course of coated felt with joints and edges sealed watertight.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
3. Remove and discard temporary seals before beginning work on adjoining roof areas.

F. Adhesive usage:

1. Adhesive Coverage: Cold application adhesive can be installed with a notch squeegee or trowel, as well as spray equipment. If spray equipment is utilized, to apply the adhesive, a notched squeegee or trowel must then be used to spread the adhesive for a consistent application rate to be obtained.
2. Average coverage per ply is 1.5 to 2.0 gallons per 100 square feet. When used over porous substrates, the coverage rate will increase to 3 to 4 gallons per 100 square feet.
3. Unless otherwise indicated, apply adhesive at a rate recommended by the approved manufacturer.
4. Adhesive Drippage: Prevent adhesive drippage from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

G. Each membrane ply shall be pressed (broom or squeegee) into place to assure total adhesion and that the ply is free of air pockets, wrinkles, fishmouths or open laps.

H. The total membrane system must be completed at one time. Phase construction is not permitted. If it is not practical to install the modified bitumen membrane cap sheet during the same day as the modified base sheet membrane, it may be delayed, but in no event shall the delay exceed five (5) calendar days. Proper cleaning and priming of exposed modified base sheet membrane may be required if left exposed.

3.6 ROOF MEMBRANE BASE SHEET INSTALLATION

A. Install modified bitumen membrane base sheet according to the roofing system manufacturer's written instructions, starting at low point of roofing system. Align modified bitumen membrane base sheet without stretching. Shingle base sheet in direction to shed water. Extend modified bitumen membrane base sheet over and terminate beyond cants.

1. Install one ply of base sheet
2. Application: Embed base sheet in a solid bed of cold process adhesive applied at rate required by the roofing system manufacturer, to form a uniform membrane without ply felts touching each other.
3. All membrane edges and end laps must be sealed by Hot Air Welding only.

3.7 ROOF MEMBRANE CAP SHEET

A. Cut the granule surfaced modified bitumen membrane cap sheet into manageable lengths (approx. 12′ – 18′).

B. Lay cut membrane sheets flat on the roof to allow the membrane to relax and flatten.

C. Apply a solid bed of cold process adhesive, at a nominal rate approved by the roof membrane manufacturer. Then flop the cap sheet into the cold process adhesive. On subsequent courses, the cap sheet should be positioned upside down, directly over the sheet in the preceding course such that the side lap area of the preceding sheet is exposed. Care must be taken to maintain minimum 3 inch side laps and 6 inch end laps. Cold process adhesive is applied in the same manner as before, making sure to not cover membrane edges or end laps where hot air welding is required. The cap sheet must be firmly set, without voids, into the cold process adhesive. All edges and end laps must be sealed by Hot Air Welding only.

D. Walkway Pads are to be installed in the same fashion as the membrane cap sheet. The location of the walkway pads should be marked out on the modified bitumen membrane cap sheet prior to installation. Walk pads shall be installed around all motorized mechanical equipment, roof access doors, roof hatches and stationary ladder locations.

3.8 FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:

1. Prime substrates with asphalt primer if required by roofing system manufacturer.
2. Backer Sheet Application: Adhere backer modified base sheet directly over vertical surfaces and onto the 1-ply modified bitumen membrane base sheet application, prior to the cap sheet installation, by cold process adhesive application with hot air welded seams and as shown on the roofing details.
3. Flashing Sheet Application: Adhere modified bitumen membrane flashing sheet to substrate by cold process adhesive application with hot air welded seams pressed into place to assure proper adhesion.

B. Extend base flashing up walls of parapets a minimum of 8 inches above roof membrane and 4 inches then 6 inches onto field of roof membrane.

C. Install mechanical fasteners at the top of base flashing where wood nailers are present and masonry anchors at concrete surfaces.

D. Install stripping where metal flanges and edgings are set on built-up roofing according to roofing system manufacturer's written instructions.

1. Stripping Material: Install two (2) plies of Type VI felt extending 4 inches then 6 inches respectively beyond the primed metal flange. The metal flange and the stripping plies shall be installed directly over the one (1) ply base sheet application prior to the cap sheet installation.

3.9 FIELD QUALITY CONTROL

A. The Architect will make periodic inspections and record their observations. Copies of the Architect's field reports shall be provided to the Owner and Contractor.

B. Owner may engage an independent testing and inspecting agency to perform field inspections and quality-assurance tests.

1. Testing agency will prepare reports stating whether inspected and tested work complies with or deviated from requirements.

C. Correct deficiencies in or remove and replace roof membrane that inspections and test reports indicate does not comply with specified requirements.

1. Repair roof membrane that does not comply with specified requirements by re-adhering test specimens back in place and by applying additional plies, equal to the original number of plies specified, over test specimens according to roofing system manufacturer's written instructions.

D. Additional testing, at Contractor's expense, may be performed to determine that corrected work complies with specified requirements.

E. The roof system manufacturer shall be required to attend the pre-construction meeting, perform monthly inspections of the roof system installation during the course of the project and perform a final inspection in the presence of the Owner, Architect and Consultant. After each inspection, a written report from the manufacturer's technical representative shall be delivered to the Architect's office for distribution to the Owner regardless of their findings.

F. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Owner.

1. Notify Owner and Owner's Architect forty-eight (48) hours in advance of the date and time of inspection by manufacturer's representative.
2. Deliver a copy of the manufacturer's final inspection report to the Architect's office for distribution to the Owner.

END OF SECTION 075216

SECTION 075420 – ADHERED PVC/KEE MEMBRANE ROOFING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Related Sections: The following Sections contain requirements that relate to this Section:

1. Rough Carpentry: Section 06100
2. Roof Insulation: Section 07220
3. Flashing and Sheet Metal: Section 07620
4. Sealants and Caulking: Section 07920

1.3 REFERENCES

A. ASTM - American Society For Testing and Materials.

B. TIMA - Thermal Insulation Manufacturer's Association.

C. UL - Underwriters Laboratories.

D. FM - Factory Mutual.

1.4 DEFINITIONS

A. Company Field Advisor: An employee of the Roof Membrane Manufacturer which lists and markets the primary components of the system under their name who is certified in writing by the Company to be technically qualified in design, installation, and servicing of the required products or an employee of an organization certified by the foregoing Company to be technically qualified in design, installation, and servicing of the required products.

1.5 SYSTEM DESCRIPTION

A. Fully Adhered PVC/KEE Flexible Sheet Membrane Roofing System: PVC/KEE Membrane fully adhered to roof insulation with approved adhesive atop high thermal insulation installed atop existing roof deck at Roof Area A-1 under Deductive Alternate #1 if selected by the Owner.

1.6 SUBMITTALS

A. Submittals Package: Submit shop drawings, product data sheets, product samples, and quality control submittals specified below at the same time as a complete package. Partial submittals will not be considered.

B. Shop Drawings for Insulation: Submit an accurate layout of the insulation showing the slopes to the drains. Show cross section drawings illustrating the location and thickness of insulation pieces.

1. Submit fastener and adhesive attachment patterns from the roof system manufacturer showing the appropriate numbers, spacing and patterns for the insulation attachments for each deck type as required to meet the specified wind uplift.

C. Product Data: Submit catalog sheets, specifications, and installation instructions for each material specified.

1. Revise the membrane manufacturer's product data as necessary to suit the requirements of the Contract Documents.
    a. Do not use or submit manufacturer's details unless there is a proposed deviation from the Contract Documents. In such instances, submit the revised detail, labeled as such, for approval. The revised detail shall show the existing conditions and the proposed change and shall be referenced directly to the related detail on the Contract Drawings.
2. Manufacturer's Warranty: Sample copy of the membrane manufacturer's Twenty (20) Year, No Dollar Limit, Total System Warranty covering workmanship and materials.

D. Samples:

1. Sheet Membrane: One 6 inch square piece.
2. Sheet Flashing: One 6 inch square piece.
3. Insulation: One 6 inch square piece.
4. Welded Seam: Two 12 inch square samples of welded seams that are representative of the quality of field welded seams. Samples must be labeled "Quality Standard Samples".

E. Quality Control Submittals:

1. Fire Hazard Certification: Submit written certification that the roof system, including the specific insulation, has been tested in conjunction with the type of structural roof deck and roof slope applicable to the project and has achieved an Underwriters Laboratories Class A external fire resistance rating.
2. Wind Uplift: Submit fastening patterns from the roof system manufacturer that indicate the specific fastener and insulation adhesive patterns to meet a 1-90 wind uplift rating.
3. Material Certification: Submit a letter from the roofing membrane manufacturer certifying that the insulation and insulation adhesives are approved for use with the roofing system.
4. Membrane Manufacturer's Certification: Submit a letter certifying that the manufacturer has been actively marketing the submitted system for a minimum of 5 years.
5. Applicator's Certification:
    a. Letter from the membrane manufacturer certifying that the applicator is and has been actively licensed or approved to install the roof system for the past five (5) years.

b. Names, address, and telephone numbers of five (5) buildings where the applicator has installed PVC/KEE sheet membrane roof systems that have had the manufacturer's warranty issued. Include the membrane manufacturer's name and the warranty number.
c. Letter certifying that the job foreman or crew chief and at least two other members of the roofing crew have installed at least five (5) PVC/KEE sheet membrane roof systems and are thoroughly familiar with all aspects of the installation.

F. Contract Closeout Submittals:

1. Warranty: Warranties as specified.

1.7 QUALITY ASSURANCE

A. Membrane Manufacturer's Qualifications:

1. The manufacturer shall have the technical expertise and qualified technical representatives to quickly resolve questions or problems that may arise both during and after the Work is completed.
2. The manufacturer shall have been actively marketing a fully adhered PVC/KEE roof system in the United States for a minimum of 5 years.
3. The manufacturer shall require that the roof system be installed by a licensed or approved applicator.

B. Applicator's Qualifications: The application of the roofing system shall be performed by an applicator licensed or approved by the membrane manufacturer. The licensed or approved applicator shall have previously installed at least five (5) PVC/KEE sheet membrane systems for which the manufacturer's warranty was issued.

1. Workers: The crew chief or foreman and at least two other members of the roofing crew shall have installed at least five (5) PVC/KEE sheet membrane roof systems and shall be thoroughly familiar with all aspects of the installation.

C. Fire Hazard Classification: The sheet membrane roof system shall have an Underwriters Laboratories Class A External Fire Resistance rating; as determined by tests conducted in conformity with UL-790 "Tests for Fire Resistance of Roof Covering Materials".

1. The roof system, which includes a specific generic type of insulation and in some instances specific name brand insulation, shall have been tested in conjunction with the type of structural roof deck and roof slope applicable to this project.

D. Material Classification Identification: All materials delivered to the site that are a component of the roofing system shall bear the UL Classification mark.

E. Pre-installation Conference: Before the roofing Work is scheduled to commence, a conference will be called by the Owner's Representative at the site for the purpose of reviewing the Drawings and the Specifications and discussing requirements for the Work. The conference shall be attended by the Contractor, the authorized roofing applicator, and the Company Field Advisor.

F. Manufacturer's Field Advisor: The roof membrane manufacturer shall provide the services of a Field Advisor. The Field Advisor shall be certified in writing by the manufacturer to be technically qualified in design, installation, and servicing of the required products. Personnel involved solely in sales do not qualify. The Field Advisor shall be present at the beginning of the actual membrane installation for the purpose of:

1. Rendering technical assistance to the Contractor regarding installation procedures of the system.
2. Familiarizing the Owner's Representative with all aspects of the system including inspection techniques.
3. Answering all questions that might arise.

G. Inspections: For the purpose of the required inspections, the Contractor shall keep the Manufacturer Field Advisor and the Owner's Representative advised of the progress of the Work and the anticipated Work schedule as the Work progresses.

H. Welded Seams (Splicing): Job site, and factory welded seams (if any) must be of the same quality and exhibit the same physical characteristics as the quality standard samples which are submitted for approval. The approved samples will be the standard of quality required for all welded seams. Failure to maintain the standard will be cause for rejection of the Work.

1. The approved samples must exhibit the following minimum physical characteristics:
   a. The welded seams must be at least as strong as the parent material. The mating surfaces of each sheet must remain fully bonded to each other when sufficient peel or shear force is applied to the seam to delaminate or break the parent material.
   b. The welded seam must be a minimum of 1-1/2 inches wide.
   c. There must be complete fusion of the mating surfaces, with no skips, voids, or fishmouths.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to the site in the manufacturer's labeled, unbroken containers.

B. Storage and Handling: Store materials in a dry, well ventilated place protected from the weather.

1. Do not store materials so as to overload the deck or structural assembly.
2. Store all materials on raised platforms covered with properly secured breathable water resistant covers. Slit shrink wrapping to not permit condensation and cover with breathable tarp.
3. Remove materials that become wet from the site.
4. Store volatile liquids in separate storage building or trailer, or remove from the site at the end of each work day.
5. Store adhesives, and sealants at temperatures between 60 deg. F and 80 deg. F.
6. Do not remove materials from factory packaging until ready for use.

1.9 PROJECT CONDITIONS

A. Regardless of any temporary power provided by the Owner, the Owner's power will not be

utilized for heat welding equipment. The applicator shall provide portable generators of the size and type recommended by the membrane manufacturer.

B. Do not execute the Work of this Section unless the Owner's Representative is present or unless he directs that the Work be performed during his absence.

C. Do not execute the Work of this Section unless the substrate is dry and free of dirt and debris.

D. Moisture Protection: Cover, seal or otherwise protect the roof and flashings so that water cannot accumulate or flow under completed portions. When and where necessary to accomplish this, provide temporary water cut-offs in accordance with the membrane manufacturer's written specifications and accepted practices of the trade.

1. Limit the removal of existing materials to areas that can be completely re-roofed or temporarily protected within the same day.

E. Do not use open flames near volatile materials.

F. During the progress of the work every effort must be made to keep odors generated by the work from entering the building.

1. Coordinate the use of materials that could cause odors to permeate the building with the Owner's representative.
2. Shut off and wrap all air intakes in the vicinity of the work.
3. Insure that all operable windows in the vicinity of the work area are closed.

1.10 WARRANTY

A. Submit Roofing Installer's Warranty, signed by Installer and the Contractor, covering Work of this Section, including membrane roofing, base flashing, roofing insulation, fasteners, metal counter flashing and roof drains and plumbing, for the following warranty period:

1. Warranty Period: Two (2) years from date of Substantial Completion of the entire project.

B. Manufacturer's Warranty: In addition to the Two (2) year period specified above, furnish the membrane manufacturer's printed 20 Year, No Dollar Limit, full system warranty covering workmanship and materials for the Work of this Section. The warranty shall include, but not be limited to, repair of leakage, and the repair and/or replacement of the roofing system caused by defects in materials or workmanship.

1. Warranty Period: Twenty (20) years from date of Substantial Completion of the entire project.

PART 2 PRODUCTS

2.1 PVC/KEE SHEET MEMBRANE AND RELATED PRODUCTS

A. PVC/KEE Sheet Membrane: UL Classified, reinforced, 60 mil thick PVC or KEE sheet membrane. The PVC/KEE sheet membrane shall be visually free of streaks, particles of foreign matter, un-dispersed raw material, pinholes, cracks, and tears, and shall be uniform in thickness. When unrolled, the membrane shall be free of wrinkles, distortions, and blisters.

1. Acceptable Manufacturers:
    a. Sarnafil – G410 EnergySmart (60 mil Sheet)
    b. Fibertite – 8155 FiberTite-XT (60 mil Sheet)
    c. or Equal

B. PVC/KEE Sheet Flashing: Reinforced, PVC/KEE sheet flashing; same material as sheet membrane.

C. Prefabricated PVC/KEE Flashing: Membrane manufacturers prefabricated flashing components including but not limited to inside and outside corners, pipe flashing, and expansion joint covers.

D. PVC/KEE Sheet Flashing Underlayment: Membrane manufacturer's polyester felt underlayment specifically intended to isolate the PVC/KEE from asphalt contaminated surface.

E. PVC/KEE Decorative Ribs: Extruded PVC/KEE roof rib used to emulate appearance of standing seam roofing. Provide a 1" high rib with a 1-3/8" base which welds to the field membrane.

F. Related Products: Furnish the membrane manufacturer's bonding adhesive, seam caulk, night seal, pourable sealer, and all other products related to the sheet membrane system.

2.2 INSULATION MATERIALS

A. General: Provide preformed, roofing insulation board that comply with requirements, selected form manufacturer's standard sizes and of thickness indicated.

B. See Section 07220 – Roof Insulation for specific insulation requirements.

2.3 FASTENERS

A. Base Flashing Fasteners (For Top Edge of Flashing):

1. Masonry Surfaces: Hardened masonry nails or drive pins thru 1-1/4 inch sheet metal discs.
2. Sheet Metal Surfaces. Hardened, self tapping, #10 sheet metal screws thru 1-1/4 inch sheet metal discs.
3. Wood Surfaces: "Cap Nail" annular ring roofing nail with one inch diameter or square solid cap, by Simplex Nails Inc., Americus, GA 31709.

B. Compression Clamp: Stainless steel worm drive hose clamp.

C. Metal Termination Bar and Fasteners:

1. Termination Bar: Factory fabricated one inch wide x .100 inches thick mill finish aluminum bar, with 1/4 inch x 3/8 inch slotted holes 8 inches o.c. and with a 1/4 inch wide 45 degree sealant and stiffener flange. "AL200 Pressure Bar" by JBD Supply, 1424 Maple Avenue, N.E., Canton, OH 44705.
2. Fasteners: Concrete or Masonry: Hard aluminum alloy or stainless steel screws with 1/4 inch diameter plastic expansion shield or 1/4 inch diameter aluminum hammer driven expansion anchor. Length as required to securely hold the compression bar tight against the flashing surface.
3. Fasteners: Wood and Sheet Metal: Hard aluminum alloy or stainless steel screw. Length as required to securely hold the compression bar tight against the flashing surface.

D. Metal Anchor Bar and Edge Retainer: Anchor Bar: 1 inch wide roll formed and punched 14 gauge galvanized steel bar.

2.4 MISCELLANEOUS MATERIALS

A. Pipe Flashing: Membrane manufacturers prefabricated pipe boot.

B. Compression Clamp (for factory fabricated flashings only): Stainless steel or cadmium plated steel worm drive clamp.

C. Sealant: One-part, low modulus, silicone sealant: Dow Corning's 790, General Electric's Silpruf, Pecora's 864, or Sonneborn's Omniseal.

PART 3 EXECUTION

3.1 SURFACE

A. Cleaning: Before the roofing installation commences, sweep and/or vacuum all surfaces as required to remove all dirt, dust, loose aggregate, foreign matter, and debris left from removals of existing roofing.

B. Testing Existing Conductor Pipes: Before commencing with the work, water test existing conductor pipes and submit a written report to the Owner's Representative, indicating which conductors, if any, are not functioning properly. Repair of interior and/or exterior drain line plumbing / ground drain leaders is not included in the lump sum contract. Repair Work (if any) to the interior and/or exterior drain line plumbing / ground drain leaders may only be accomplished by prior acceptance by the Owner as a Change Order to this Contract.

C. Testing Pull-Out Resistance of Roof Fasteners: Before commencing with the roofing work, in the presence of the Owner's Representative, install approved insulation fasteners to the structural deck. Uplift of the insulation fasteners shall meet the minimum requirements of the roofing system manufacturer.

1. Do not proceed with the roofing work if the uplift out resistance of the roof insulation fasteners is less than that required by the roofing system manufacturer.

3.2 INSTALLING INSULATION

A. See Section 07220 – Roof Insulation for insulation installation

3.3 INSTALLING PVC/KEE SHEET MEMBRANE

A. Installing PVC/KEE Sheet Membrane:

1. The substrate shall be inspected prior to base component installations.
2. Do not allow the membrane to come in contact with surfaces contaminated with asphalt, coal tar, oil, grease, or other substances that are not compatible with PVC/KEE.
3. Install the membrane so the sheets run perpendicular to the slope of the system.
4. To avoid accidental water entrapment, start at the low point of the roof and work towards the high point. Lap the sheets so the flow of water is not against the edges of the sheet.
5. Position the membrane so it is free of buckles and wrinkles. Lap edges and ends of sheets as recommended by the manufacturer, but not less than 3 inches.
6. Fully Adhered PVC/KEE Membrane: Unroll the PVC/KEE roofing membrane and position without stretching. Allow the membrane to relax at least 30 minutes when the temperature is above 60 degrees Fahrenheit, or 45 minutes when the temperature is below 60 degrees Fahrenheit, prior to the installation. Inspect for any damaged membrane. Remove sections of membrane that are creased or damaged. Adhere the PVC/KEE membrane to the insulation with bonding adhesive.
    a. Apply bonding adhesive to both mating surfaces at the rate recommended by the manufacturer. Do not leave any skips or voids.
    b. Allow the adhesive to dry in accordance with the manufacturer's instructions.
    c. Install the flashing so it is free of wrinkles, voids, and blisters.
    d. Do not allow bonding adhesive to come in contact with areas to be hot air welded.
    e. Do not allow the flashing to bridge where it changes direction from vertical to horizontal.
7. The roofing contractor shall check all welded seams for continuity and integrity using a rounded screwdriver or other suitable blunt object. Seam checks shall be made daily by the contractor. For seam welding validation, it may be required that sample of seams, 2" wide and 12" long, shall be taken a minimum of three times a day from completed seams; at least one to be from the first seam made of the day. Each test cut shall be patched by the contractor at no extra charge to the owner. Test cuts shall be used to determine adequate seam strength on the rooftop by the roofing contractor.
8. Install membrane and flashing sheets simultaneously. Splice all seams as the membrane and flashings are being installed (same working day).
9. At perimeter or raised dimensional wood detailing, turn the membrane over the front edge of the nailer. Secure the membrane to the vertical portion of the nailer.
10. At parapet walls, intersecting building walls and curbs secure the membrane to the structural deck with edge retainer and anchor bar fastened 12 inches o.c.

B. Splicing PVC/KEE Sheet Membrane and Flashing:

1. Splice all side and end laps of the sheet membrane and flashing, and all connections to PVC/KEE coated metal (if applicable). Hot air weld all splices with automatic hot air welders. Hand held welders may only be used for small localized areas and for areas that are inaccessible to automatic welders.
2. Before splicing seams remove all dirt, any dust, and foreign matter from the foreign matter. If detergent washing is required, wash off all detergent residue with clean water and allow the splice area to dry of all residue before welding.
3. Each day before welding the roofing membrane, test weld scrap samples from the actual rolls of membrane to be installed on that day to insure that the welders are calibrated properly and that the membrane has not cured.
4. Where a spliced seam running in one direction passes beneath or above a sheet of membrane running perpendicular to the seam (T joint), hand weld the seam at the intersection and use a small roller to insure that there are no voids or pin holes at the intersection caused by the raised seam edge. Apply lap sealant at the edges of the seam. Extend the lap sealant a minimum of 6 inches beyond each intersecting corner.
5. Samples of welded seams must be taken each day that seams are welded. Refer to FIELD QUALITY CONTROL.

C. Bonding PVC/KEE Membrane Underlayment and Flashing:

1. Before installing flashing, adhere PVC/KEE sheet flashing underlayment to the substrate with bonding adhesive so that all contaminated surfaces are completely hidden.
2. Adhere the PVC/KEE membrane flashing to the underlayment with bonding adhesive.
3. Applying Bonding Adhesive:
    a. Apply bonding adhesive to both mating surfaces at the rate recommended by the manufacturer. Do not leave any skips or voids.
    b. Allow the adhesive to dry in accordance with the manufacturer's instructions.
    c. Install the flashing so it is free of wrinkles, voids, and blisters.
    d. Do not allow bonding adhesive to come in contact with areas to be hot air welded.
    e. Do not allow the flashing to bridge where it changes direction from vertical to horizontal.

D. Phasing of Membrane Installation:

1. At the end of each working day temporarily seal the loose edge of the membrane so that water does not flow beneath the completed portion. Spud off all existing aggregate (if any) in the area to be sealed, remove all dirt, dust and foreign matter. Install the temporary seal.
    a. Apply the membrane manufacturer's night seal over the area to be sealed. Embed the membrane into the night seal. Apply a continuous weight over the membrane and night seal. Before the work resumes, cut off and discard all portions of the membrane that have been embedded in the night seal.
2. Install flashings as the membrane is being installed (same working day). If the flashing cannot be completely installed in one day, progress the installation until the flashing is in a watertight condition.

E. Installing PVC/KEE Base Flashing:

1. Install the flashing so it extends onto the roof surface a minimum of 3 inches beyond the fasteners that secure the roofing membrane. Terminate the flashing on the vertical surface where shown on the drawings.
2. Adhere the flashing to the vertical surface with bonding adhesive. Splice the flashing to the roof membrane.
3. At inside and outside corners splice a prefabricated PVC/KEE patch over the corners. Position the patch so it wraps around the corner onto each vertical surface and onto the roof surface a minimum of 3 inches.
4. Secure the top edge of the flashing with fasteners 12 inches o.c.

F Installing Cover Strips At PVC/KEE Coated Metal Base Flashing:

1. Install the metal base flashing over the roofing membrane. Strip in the horizontal portion of the base flashing with a reinforced PVC/KEE cover strip. Extend the cover strip onto the roof surface a minimum of 3 inches beyond the metal flange.
2. Hot air weld the cover strip to the PVC/KEE coated metal base flashing and to the roof membrane.

G Installing Termination Bar:

1. Where base flashing does not terminate beneath a cap flashing, seal the top edge as follows:
   a. Install a continuous metal termination bar over the top edge of flashing and secure one foot o.c. maximum or as required to provide full compression on all the mastic/sealant behind the membrane. Leave a 1/4 inch gap between ends for expansion and do not span across expansion joints.
   b. Apply a bead of sealant along the top edge.

H. Installing Formed PVC/KEE Pipe Flashing:

1. Wherever possible, flash pipe penetrations with the manufacturer's pre-molded pipe flashing.
2. Clean existing pipe of all contaminates or wrap pipe with manufacturer's separation tape.
3. Install flashing over the membrane extending a minimum of 2 inches out from the pipe base. Turn the flashing up 1/2 inch onto the pipe.
4. Coat the pipe, with bonding adhesive.
5. Wrap a second piece of flashing around the pipe. Extend the flashing 1/2 inch onto the horizontal portion of previously installed flashing. Hot air weld the flashing to the membrane and to the wrapped flashing. Install compression clamp around top of flashing. Apply lap sealant at the top edge of the flashing.

I. Installing PVC/KEE Gravel Stop Flashing:

1. Install the canted water dam portion of the gravel stop over the roofing membrane. Strip in the water dam with one strip of reinforced sheet flashing. Extend the flashing over the front edge of the water dam a minimum of one inch and out past the base of the cant a minimum of 3 inches.

2. Adhere the flashing to the water dam with bonding adhesive and hot air weld the flashing to the roofing membrane.
3. Install the fascia portion of the gravel stop.

J. Installing PVC/KEE Decorative Ribs:

1. Using a chalk line and removable chalk, mark out a line for laying the rib profile.
2. Pre-assemble the rib profile sections to create the required length(s) using the plastic connectors. Insert a connector into the end of one the rib profile sections. Insert the exposed portion of connector into a second rib profile section butting the two sections together.
3. Using a hand welder, hot-air weld ends of adjoining the rib profiles together.
4. Align the rib profile along the chalk line. The rib profile should generally line up with the edge of Sarnafil membrane overlap. Do not cover overlap.
5. If using the an automatic welding machine with a rib profile adapter kit, position machine to start the weld. Regularly check the rib profile guide. If hand welding, a 2 x 8 inch (50 x 203 mm) nailer may be needed to keep the rib profile straight.
6. Hand weld the rib profile in areas where the automatic welder cannot be used. If required, a piece of membrane is heat welded over the exposed end and trimmed to give a clean finish.

3.5 FIELD QUALITY CONTROL

A. In the presence of the Owner's Representative closely examine and probe all seams in the membrane and flashing.

1. Probe the edges of all welded seams with a blunt tipped cotter pin removal tool. Use sufficient hand pressure to detect marginal welds, voids, skips, and fishmouths. Repair all defective areas.
2. Each day that seams are welded, a minimum of two, 2 inch wide x 8 inch long cross section samples must be taken thru the completed seams. Cut the sample in the presence of and where directed by the Owner's Representative. Failure of the samples to maintain the standard of quality of the approved samples will be cause for rejection of the Work.
3. Repair all areas of welded seams where samples have been taken.

END OF SECTION 075420

SECTION 076200 – FLASHING, SHEET METAL & ACCESSORIES

PART ONE - GENERAL

1.1 DESCRIPTION

A. Work included: Provide all flashing and sheet metal not specifically described in other Sections of these Specifications but required to prevent penetration of water through exterior shell of building. Scope of Work shall be as shown on the Drawings:

B. Related work described elsewhere:

1.	Selective Demolition	Section 02070
2.	Modified Bitumen Membrane Roofing	Section 07570
3.	Sealants and Caulking	Section 07920

1.2 QUALITY ASSURANCE

A. Standards: Comply with standards specified in this Section.

B. Qualification of manufacturer: Prefabricated products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Owner.

C. Qualification of installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3 SUBMITTALS

A. General: Comply with provisions of General Conditions.

B. Manufacturer's data: Within ten (10) calendar days after receipt of the Notice to Proceed, submit:

1. Complete materials list of all items proposed to be furnished and installed under this Section indicating amount, gauge and/or weight, dimensions, and type.
2. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.
3. The manufacturer's recommended installation procedures and the shop drawings, when approved by the Owner, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the Work.

1.4 PRODUCT HANDLING

A. Protection: Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no additional cost the Owner.

PART 2 - PRODUCTS

2.1 DESIGN

A. Standard commercial items may be used for flashing, trim, and reglets, provided all such items meet or exceed the quality standards specified herein.

B. Quality standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations contained in "Architectural Sheet Metal Manual," current edition of the Sheet Metal and Air Conditioning Contractors National Association.

2.2 RIVETS

A. Use only soft iron rivets having a rust-resistive coating when required.

2.3 FLUX AND SOLDER

A. All flux used shall be rosin.

B. All solder used shall conform to ASTM B-32, Grade Sn50, used with rosin flux.

2.4 COUNTER FLASHING

A. Provide min. 4″ counter flashing at all vertical flashing locations.

B. Existing counter flashing shall be reused, when available, with minor repairs as required.

C. New counter flashing metal, when required, shall match the existing metal, which it is to be in contact with. (.032 mil finish aluminum, .018 stainless steel, 16 oz copper and/or 26 gauge galvanized).

2.5 PITCH POCKETS

A. Pitch pockets shall be the selected roof system manufacturer’s pre-engineered pitch pocket assemblies with approved fill materials.

B. In the event that the manufacturer’s pre-engineered pitch pockets cannot be utilized, material for pitch pockets shall be shop fabricated penetration pans made of 16 oz copper sized to provide adequate filler material around the roof penetration. All joints shall be soldered weather tight.

C. Hoods for pitch pockets shall be 16 oz copper. All joints shall be soldered. New hoods shall be required at all pitch pocket locations.

D. All pitch pockets must not be excluded from the roof membrane manufacturer’s warranty / guarantee. Alternative detailing methods at pitch pocket locations that are part of the selected manufacturers warranty will also be accepted.

2.6 METAL EDGE & METAL DRIP EDGE

A. Material for perimeter metal edge and metal drip edge shall be minimum 24 gauge (minimum) galvalume with a Kynar (or approved equal) finish. Finish shall be minimum 70% Kynar fluorocarbon coating.

B. Provide pre-engineered metal edge system tested per ANSI/SPRI ES-1 for the wind uplift requirements of the project. Provide the manufacturer's 20 year, 110 mph (minimum) wind warranty on the metal edge system.

C. Metal drip edges at gutter locations shall be fabricated in accordance with the Contract Documents and SMACNA guidelines. Continuous cleats shall be one gauge heavier than the metal edge.

D. Color as selected by the Owner from the manufacturer's full range of colors.

2.7 EXPANSION JOINTS

A. Material for pre-fabricated expansion joints shall be 4" neoprene bellows and .040 aluminum flanged components as provided or approved by the roof system manufacturer.

B. Material for metal expansion joints shall be shall be 16 ounce copper with 16 ounce copper back up plates and continuous cleats.

2.8 GUTTERS, DOWNSPOUTS & CONDUCTOR HEADS

A. Material for shop fabricated gutters and downspouts shall be of 24 gauge (minimum) "Galvalume" or G-90 galvanized steel. Finish shall be a full strength 70% Kynar 500 or Hylar 5000 resin system.

B. Material for conductor heads shall be shall be of 24 gauge (minimum) "Galvalume" or G-90 galvanized steel. Finish shall be a full strength 70% Kynar 500 or Hylar 5000 resin system.

C. Provide all outlets, end caps, expansion joints, miters, hangers, straps and accessories as required to provide a complete, functional and watertight system.

D. Color as selected by the Owner from the manufacturer's full range of colors.

E. Furnish and install new 12 x 31 inch reinforced concrete splash blocks shall be installed at all downspout locations that are not serviced by a ground drain leader. At low slope membrane roof areas, a protective layer of membrane or walk pad material shall be placed beneath the splashblock.

F. All ground drain leaders shall be water tested to ensure proper flow of water. Any ground drain leaders that are clogged shall be reported to the Owner and Architect.

2.9 GUTTER SCREENS

A. Material for gutters screens shall be .020 aluminum prefabricated product; 'Gutter Solution" by GutterSupply.com or equal.

1. Gutter screens metal shall have .095 drainage holes and be designed to handle 22" of rain fall

per hour.
2. Screen profile shall have a four rib design to strengthen system.
3. System shall attach into the fascia and onto the outer lip of the gutter.

B. Color shall be as selected by the Owner from the manufacturer's full range of colors.

2.10 METAL WALL PANELS

A. Materials for new metal wall panels shall be 24 gauge "Galvalume" or G-90 galvanized steel with a Kynar (or approved equal) finish. Finish shall be minimum 70% Kynar fluorocarbon coating.

B. Color as selected by the Owner from the manufacturer's full range of colors.

C. Provide a 1 1/2" flush metal wall panel system with concealed fastening. Panels shall have a smooth finish and be 12" wide or as required to match existing metal wall panels on adjacent roof area. Panels shall have an interlocking side lap feature with factory applied sealant in the laps.

D. Provide all shims, closures, trim, flashings and accessories as required to provide a complete, secure, watertight and weathertight wall panel system.

2.11 METAL SOFFIT PANELS

A. Materials for new metal soffit panels shall be .032 aluminum with a Kynar (or approved equal) finish. Finish shall be minimum 70% Kynar fluorocarbon coating. Color shall be approved by the Owner.

B. Provide a non-vented, metal soffit panel system with concealed fasteners. Panels shall have a smooth finish and be 12" wide. Panels shall have an interlocking side lap feature. Basis of design is PAC-750 by Peterson Aluminum Corp. or equal.

C. Provide all shims, closures, trim, flashings and accessories as required to provide a complete, secure, watertight and weathertight soffit panel system.

2.12 METAL ROOF HATCH

A. Provide a pre-engineered, fully welded, aluminum (11 gauge minimum) roof hatch with compression spring operator, hold-open arm lock, fully insulated cover and curb, and EPDM gasket as manufacturer by Bilco or equal. Size of new hatch shall be 30" x 36" minimum.

2.13 METAL EQUIPMENT CURBS & EXHAUST FAN UNITS

A. Provide pre-engineered, fully welded, aluminum (11 gauge minimum) roof curbs with mitered and welded corner seams, integral base plates, and pressure treated wood nailers.

B. Provide new fractional horse power exhaust fan units to match the existing size, type, motor, controls, voltage and CFM of each existing unit. Curb caps and removable motor covers shall be heavy gauge aluminum. Provide permanent stamped aluminum nameplates with exact model and serial number identification for each unit.

2.14 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the Owner and warranty coverage by the manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 WORKMANSHIP

A. General:

1. Form all sheet metal accurately and to the dimensions and shapes required, finishing all molded and broken surfaces with true, sharp, and straight lines and angles and, where intercepting other members, soldering securely.
2. Unless otherwise specifically permitted by the Owner, turn all exposed edges back 1/2".

B. Weatherproofing:

1. Finish watertight and weathertight where so required.
2. Make all lock seam work flat and true to line.
3. Make all lock seam and lap seams, when soldered, at least 1/2" wide.
4. Make all flat and lap seams in direction of flow.
5. Counter flashing at curbs shall be lapped a minimum of 4" and riveted, and sloped from the penetration to arrest water from laying on the detail.

C. Nailing:

1. Whenever possible, secure metal by means of clips or cleats without nailing through the metal.
2. In general, space all screws not more than 8" apart, where exposed to the weather, and use neoprene washers.
3. For nailing into brick, use drilled plugholes and plugs.
4. For nailing into wood blocking, space nails 3” o.c. staggered.

3.3 EMBEDMENT

A. Prime metal flanges on all metal components top and bottom with asphalt primer prior to installation.

B. Embed all metal in connection with roofs in a solid bed of sealant, using materials and methods described in these Specifications or other materials approved in advance by the Owner.

3.4 SOLDERING

A. General:

1. Thoroughly clean and tin all joint materials prior to soldering.
2. Perform all soldering slowly with a well heated copper in order to heat the seams thoroughly and to completely fill them with solder.
3. Perform all soldering with a heavy soldering copper of blunt design, properly tinned for use.
4. Make all exposed soldering on finished surfaces neat, full flowing, and smooth.
5. Sweat open existing seams when required for accommodation of base flashing at mechanical curbs, etc.
6. Cleaning: After soldering, thoroughly wash acid flux with a soda solution.

END OF SECTION 07620

SECTION 079200 – ELASTOMERIC JOINT SEALANTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Throughout the Work, seal all joints as required to provide a positive barrier against passage of air and passage of moisture. In general, Work of this Section includes cleaning and caulking miscellaneous joints as needed.

B. Related work described elsewhere:

1. Cold Process Modified Bitumen Roofing - Section 07570
2. Flashing and Sheet Metal - Section 07620

1.2 QUALITY ASSURANCE

A. Standards: Comply with all standards specified in this Section.

B. Qualifications of Manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Owner.

C. Adhere strictly to the details shown on the Drawings or in manufacturer's recommended procedures.

D. Qualifications of Installer:

1. Proper caulking and proper installation of sealant requires that installer be thoroughly trained and experienced in the necessary skills and thoroughly familiar with the specified requirements.
2. For caulking and installation of sealant throughout the Work, use only personnel who have been specifically trained in such procedures and who are completely familiar with the joint details shown on the Drawings and the installation requirements called for in this Section.

1.3 SUBMITTALS

A. General: Comply with provisions of the General and Special Conditions.

B. Manufacturer's data: Within ten (10) calendar days after receipt of the Notice to Proceed, submit:

1. A complete materials list showing all items proposed to be furnished and installed under this Section.
2. Sufficient data to demonstrate that all such materials meet or exceed the specified requirements.
3. Specifications, installation instructions, and general recommendations from the materials manufacturers showing procedures for installation.

C. Upon approval by the Owner, the proposed installation procedures will become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

D. Samples: Upon request, submit samples of products to be used, within ten (10) days of such request.

1.4 PRODUCT HANDLING

A. Delivery and storage: Deliver all materials of this Section to the job site in the original unopened containers with all labels intact and legible at time of use. Store only under conditions recommended by the manufacturers. Do not retain on the job site, any material that has exceeded the shelf life recommended by its manufacturer.

B. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 SEALANTS

A. General: Except as specifically otherwise directed by the Owner, use only the type of sealant described in this Article.

B. Sealant shall be a gun grade, compound conforming to ASTM C-920-79. Each color and each class of sealant shall be the product of a single manufacturer selected from the following, or shall be equal products as approved in advance by the Owner.

1. Acceptable products include:
    a. Rexnord Chemical Products, Inc. (Sonneborn) - "Sonolastic NP I".
    b. Products Research and Chemical Corp. - "Rubber Calk 350".
    c. Woodmont Products, Inc. - "Chem-Calk 500".
    d. Tremco - "Dymeric".

C. Colors: Colors for each sealant installation will be selected by the Owner from standard colors normally available from the specified manufacturers. Should such standard color not be available from the approved manufacturer, except at additional charge, provide all such colors at no additional cost to the Owner.

1. In concealed installations, and in partially or fully exposed installations where so approved by the Owner, standard aluminum gray sealant may be used.

2.2 PRIMERS

A. Use only those primers, which are non-staining, have been tested for durability on the surfaces to be sealed, and are specifically recommended for this installation by the manufacturer of the sealant used.

2.3 BACKUP MATERIALS

A. General: Use only those backup materials which are specifically recommended for this installation by the manufacturer of the sealant used, and which are nonabsorbent and non-staining.

B. Acceptable types include:

1. Closed-cell-sponge of vinyl or rubber.
2. Polychloroprene tubes or beads.
3. Polyisobutylene extrusions.
4. Oil-less dry jute.

2.4 BOND-PREVENTIVE MATERIALS

A. Use only one of the following as best suited for the application and as recommended by the manufacturer of the sealant used:

1. Polyethylene tape, pressure-sensitive adhesive, with the adhesive required only to hold tape to the construction materials as indicated.

2.5 MASKING TAPE

A. For masking around joints, provide masking tape conforming to manufacturer standards.

2.6 OTHER MATERIALS

A. All other materials, not specifically described but required for complete and proper caulking and installation of sealants, shall be first quality of their respective kinds, new, and as selected by the Contractor subject to the approval of the Owner.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Concrete and masonry surfaces:

1. All surfaces in contact with sealant shall be dry, sound, and well brushed and wiped free from dust.
2. Use solvent to remove oil and grease, wiping the surfaces with clean rags.
3. Where surfaces have been treated, remove the surface treatment by use of sandblasting or wire brushing.
4. Remove all laitance and mortar from the joint cavity.
5. Where backstop is required, insert the approved backup material in the joint cavity to the depth required.

B. Steel surfaces:

1. Steel surfaces in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish, the metal shall be scraped or wire-brushed to remove mill scale.
2. Use solvent to remove oil and grease, wiping the surfaces with clean rags.
3. Remove protective coatings on steel by sandblasting or by a solvent that leaves no residue.

3.3 INSTALLATION OF BACKUP MATERIAL

A. Use only the backup material recommended by the manufacturer of the sealant and approved by the Owner for the particular installation, compressing the backup material 25% to 50% to achieve a positive and secure fit. When using backup of tube or rod stock, avoid lengthwise stretching of the material. Do not twist or braid hose or rod backup stock.

3.4 PRIMING

A. Use only the primer recommended by the manufacturer of the sealant and approved by the Owner for the particular installation. Apply the primer in strict accordance with the manufacturer's recommendations.

3.5 BOND-BREAKER INSTALLATION

A. Install an approved bond-breaker where recommended by the manufacturer of the sealant and where directed by the Owner, adhering strictly to the installation recommendations.

3.6 INSTALLATION OF SEALANT

A. General: Prior to start of installation in each joint, verify the joint type according to the Details in the Drawings, and verify that the required proportion of width of joint to depth of joint has been achieved.

B. Equipment: Apply sealant under pressure with hand or power-actuated gun or other appropriate means. Guns shall have nozzle of proper size and shall provide sufficient pressure to completely fill joints as designed.

C. Masking: Thoroughly and completely mask all joints where the appearance of sealant on adjacent surfaces would be objectionable.

D. Installation of sealant: Install the sealant in strict accordance with the manufacturer's recommendations, thoroughly filling all joints to the recommended depth.

E. Tooling: Tool all joints.

F. Cleaning up:

1. Remove masking tape immediately after joints have been tooled.
2. Clean adjacent surfaces free from sealant as the installation progresses. Use solvent or cleaning agent as recommended by the sealant manufacturer.

END OF SECTION 079200

SECTION 099113 – EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Technical Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation, painting, and finishing of exposed exterior items.

1. Surface preparation, priming, and finish coats specified in this Section are in additions to shop-priming and surface treatment specified under other Sections.

B. Paint exposed surfaces where rust /corrosion has begun to develop, except where a surface or material is specifically indicated not to be painted or is to remain natural.

1. Painting includes field painting of the following items:
   a. Existing equipment hoods that are not to be replaced and have been painted previously or are showing signs of corrosion development.
   b. A minimum of one primer coat and two finish coats are required.

C. Painting is not required on pre-finished items, finished metal surfaces, concealed surfaces, operating parts, and labels.

1. Pre-finished items not to be painted include the following factory-finished or pre-finished components:
   a. Pre-finished metal.
   b. Pre-painted equipment hoods showing no sign of corrosion.
   c. New pre-painted metal components

D. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 07620 - Flashing and Sheet Metal.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each paint system specified, including primers and finish coats.

1. List each material and cross-reference the specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.
2. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

C. Samples for initial color selection in the form of manufacturer's color charts.

1. After color selection, the Owner will furnish color designations for surfaces to be coated.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.6 PROJECT CONDITIONS

A. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F and 95 deg F.

B. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Devoe and Raynolds Co. (Devoe).
2. Fuller O'Brien (Fuller).
3. The Glidden Company (Glidden).
4. Benjamin Moore and Co. (Moore).

5. PPG Industries, Pittsburgh Paints (PPG).
6. Pratt and Lambert (P & L).
7. The Sherwin-Williams Company (S-W).

2.2 PAINT MATERIALS, GENERAL

A. Materials Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.

B. Material Quality: Provide the manufacturer's best-quality trade sale paint material of the various coating types specified.

1. Propriety Names: Use of manufacturer's proprietary product names to designate colors of materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish the manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Provide color selections made by the Architect from the manufacturer's full range of standard colors, where applicable.

2.3 PRIMERS

A. Primers: Provide the manufacturer's recommended factory-formulated primers that are compatible with the substrate and finish coats indicated.

B. Available Products: Subject to compliance with requirements, prime coat materials that may be incorporated in the Work include, but are not limited to, the following.

1. Ferrous Metal Primer: Synthetic, quick-drying, rust-inhibiting primer applied at spreading rate recommended by manufacturer to achieve total dry film thickness recommended by manufacturer but not less than 1.3 mils.

a. Devoe: 13101 Mirrolac Cover Up Rust Penetrating Primer.
b. Fuller: 621-04 Blox-Rust Alkyd Metal Primer.
c. Glidden: 5205 Glid-Guard Tank & Structural Primer, Red.
d. Moore: IronClad Retardo Rust-Inhibitive Paint #163.
e. PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.
f. S-W: Kem Kromik Metal Primer B50N2/B50W1.

2. Galvanized Metal Primer: Applied at spreading rate recommended by manufacturer to achieve total dry film thickness recommended by manufacturer, but not less than 1.2 mils.

a. Devoe: 8502/8520 Mirrolac - WB Interior/Exterior Waterborne Flat DTM Primer and Finish.
b. Fuller: 621-05 Blox-Rust Latex Metal Primer.
c. Glidden: 5229 Glid-Guard Tank and Structural Primer, Red.
d. Moore: IronClad Galvanized Metal Latex Primer #155.
e. PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.

f. S-W: Galvite Paint B50W3.

2.4 EXTERIOR FINISH PAINT MATERIAL

A. Finish Paint: Provide the manufacturer's recommended factory-formulated finish-coat materials that are compatible with the substrate and undercoats indicated.

B. Available Products: Subject to compliance with requirements, finish coat materials that may be incorporated in the Work include, but are not limited to, the following:

1. Alkyd Gloss Enamel: Weather-resistant, air-drying, high-gloss exterior alkyd enamel, applied in 2 coats at spreading rate recommended by manufacturer to achieve a total dry film thickness recommended by manufacturer, but not less than 3.0 mils.

a. Devoe: 70XX Mirrolac Interior/Exterior Alkyd-Urethane Gloss Enamel.
b. Fuller: 312-XX Heavy Duty Industrial maintenance Enamel.
c. Glidden: 4500 Glid-Guard Alkyd Industrial Enamel.
d. Moore: Impervo Enamel #133.
e. PPG: 6-282 Speedhide Interior/Exterior Gloss - Oil Enamel.
f. P & L: S5400 Series Tech-Guard Maintenance Gloss Enamel.
g. S-W: Industrial Enamel B-54 Series.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly dry before paint is applied.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected.
2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Owner about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area,

have items reinstalled by workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to the manufacturer's instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible paints, or remove and prime.
2. Ferrous Metals: Clean ungalvanized ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substrates. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council (SSPC).
    a. Blast steel surfaces clean as recommended by the paint system manufacturer and according to requirements of SSPC specification SSPC-SP 10.
    b. Treat bare and sandblasted or pickled clean metal with a treatment wash coat before priming.
    c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.
3. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Materials Preparation: Carefully mix and prepare paint materials according to manufacturer's directions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density; stir as required during application, stain material before using.
3. Use only thinners approved by the paint manufacturer and only within recommended limits.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

1. Locations of surfaces to be painted are indicated on contract drawings or specified, or both.
2. Provide finish coats that are compatible with primers used.
3. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce a smooth

even surface according to the manufacturer's directions.

4. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
5. Omit primer on metal surfaces that have been shop-primed and touch-up painted.

C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.

1. Brushes: Use brushes best suited for the material applied.
2. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

E. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

F. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime-coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

G. Pigmented (Opaque) Finished: Completely cover to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be accepted.

H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

3.4 CLEANING

A. Cleanup: At the end of each work day, remove empty cans, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 099113

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SECTION 150000 - PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Technical Specification Sections, apply to this Section.

1.2 PERMITS

A. Contractor shall give all required notices and secure all necessary permits. Inspection certificates from local authorities having jurisdiction shall be delivered to the Architect prior to final payment.

1.3 DESCRIPTION OF WORK

A. The work covered by this section includes the furnishing of all labor, materials, equipment and services necessary for the installation of new cast iron drain bowls to replace damaged as required and associated connections/piping, as needed for proper completion of the work and successful operation of the entire drainage system.

B. Replacement of all existing drain bowl parts at existing drain bowls to remain in place (i.e. clamping rings, bolts and strainers) is included in the scope of work for the base bid.

1.4 SCOPE OF WORK

A. Remove all existing drain bowl parts and replace with new to match existing bowl assembly.

B. Install new primary drain bowls at all existing drain locations as required to replace existing damaged assemblies. Include interior piping and connections as required to make new drain bowls fully functional.

1.5 CODES

A. All work must be performed in strict accordance with all rules and regulations of local, state and federal building codes for work of this type.

1.6 INTENT

A. It is the intent of the specifications and drawings to call for complete and finished work, tested and ready for operation.

B. Any apparatus, appliance, materials, or work not shown on drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete in all respects and ready for operation, shall be furnished, delivered and installed by the trade without additional cost to the Owner.

C. Minor details not shown or specified, but necessary for proper operation, shall be included in the work.

1.7 SHOP DRAWINGS/PRODUCT DATA

A. Submit to the Owner for approval a minimum of three (3) copies of shop drawings, manufacturer's descriptive literature, catalog data or such other data as will clearly show that the new drains, piping, fittings and insulation and duct extension material offered will meet the requirements of the specifications.

B. Approval of the above shall in no way be construed as relieving the trade of complying with the Contract requirements or building codes.

C. If materials or equipment is installed before it is approved, the contractor shall be liable for its removal and replacement at no extra charge to the Owner, if, in the opinion of the Owner or Owner's Architect, the material or equipment does not meet the intent of the drawings and specifications.

1.8 DRAWINGS AND LAYOUT OF THE WORK

A. The drawings are diagrammatic only and do not necessarily show all offsets and connections, but show in general, locations only. The trade shall make all necessary field measurements and assume responsibility for their accuracy.

B. Lay out work prior to beginning installation. In laying out the work, reference shall be made to existing conditions in order to avoid interruptions and allow proper flow as required by code.

C. If directed by the Owner, the contractor shall without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

1.9 MATERIAL AND WORKMANSHIP

A. All materials and apparatus required for the new work shall be new (unless specifically designated otherwise), of first class quality and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first class standard article as approved by the Owner shall be furnished.

B. Unless otherwise specifically indicated on the drawings or specifications, all equipment and materials shall be applied with the approval of the Owner in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.

1.10 SUPPORTS

A. This trade shall provide and install supports and hangers required for the proper installation of piping and drains installed and connected in accordance with these specifications and accompanying drawings (if any). Hangers shall include all threaded rod, brackets, fittings, insulation protection plates, anchors, steel angle supports, etc. necessary for a complete job and required by code.

1.11 STRUCTURAL DIFFICULTIES

A. Should any structural difficulties prevent the running of pipes, etc., at points as shown on the plans, minor necessary deviations therefrom, as determined by the Owner or Owner's Architect, may be permitted and must be made without additional cost to the Owner.

1.12 WEATHERPROOFING

A. All items exposed to the weather shall be completely waterproof. This trade shall furnish all gaskets, caulking, coverings, adhesives, etc., necessary to accomplish this end.

1.13 WARRANTY-GUARANTEE

A. Contractor shall furnish written warranty, countersigned and guaranteed by the General Contractor, stating that work executed under this Section of the Specifications shall be free from defects of materials and workmanship for a period of 12 months from date of Substantial Completion.

B. During the guarantee period, the Contractor shall repair or replace defective material and workmanship and place same in working order to the satisfaction of the Architect at no additional expense to the Owner.

PART 2 - PRODUCTS

2.1 ROOF DRAINS

A. General: Certain manufacturer's catalog numbers are used herein for designation of drains, but the accepted equivalent products of J. R. Smith or Zurn will be acceptable. Provide proper roof support for all drains.

1. Primary Roof Drains (for replacement of existing drain bowls or additional new drains as required): J. R. Smith model DX1010Y04 wide flange body with under deck clamp, cast iron clamping ring and vandal proof cast iron dome, size as indicated on drawings, 4" minimum.

2.2 DRAIN AND VENT PIPING

A. Above ground rain leader and vent piping shall be hubless cast-iron, or DWV Schedule 40 PVC pipe (ASTM D2665) and fittings, except that PVC pipe shall not be used where piping penetrates fire partitions or plenum air spaces or any location not allowed by the Building Code.

B. Foam Core PVC piping is not acceptable for any application.

C. Schedule 80 PVC may be used.

D. Hubless pipe and fittings shall be assembled using neoprene gasket and stainless-steel retaining sleeve. PVC pipe and fittings shall be assembled in strict accordance with manufacturer's instructions. Solvent cement shall conform to ASTM D2564.

2.3 PIPE HANGERS AND SUPPORTS

A. Pipe and pipe supports shall be provided as required to meet code and shall include pipe clamp hangers of the proper size for the piping and insulation indicated and 1/2" (minimum) threaded rods to suspend indicated piping. Provide maximum slope to drain (1/4" - ft. minimum). Insure that each rod is adjusted to carry its proper weight.

2.4 INSULATION

A. Insulate all new drain bowls and overflow drainage piping with Owens Corning 1-inch thick Fiberglass SSL II ASJ one piece pipe insulation or approved equal, having white all service vapor barrier jacket lapped and sealed at all joints with a white vapor barrier adhesive or approved equal. Staples will not be permitted in securing jacket of insulation.

1. All insulation, covering, adhesives, mastic and cement shall be listed and approved by Underwriters Laboratories, and shall be furnished and installed in accordance with the manufacturer's current recommendations. Insulation cement and other materials shall contain no asbestos.
2. All pipe insulation shall be rated with a Flame Spread rating of 25 or less and smoke development rating of 50 or less.

PART 3 - EXECUTION

3.1 GENERAL

A. The drawings and specifications are intended to be complimentary.

B. Piping shall run as straight and direct as possible, forming a right angle with or parallel to walls, bar joist, steel beams or other piping.

C. All piping, fixtures and equipment shall be adequately protected during construction. All cut pipe must have ends reamed and be free from burrs.

D. All piping shall be installed to provide a clearance of at least 1 inch from the finished covering, or between finished coverings, or between finishing covering an adjoining work. All piping at or in the ceiling shall be hung from the structural construction above as close as practicable to the bottom of roof supporting structure. In no case shall pipes penetrate through ventilating ducts or beams.

E. All pipe shall be arranged to be accessible for repairs and replacement without disturbing adjacent construction, wherever possible.

F. Before any work under this section is installed, clearance required shall be carefully checked. Provide shop drawings showing any significant deviations from work indicated for approval prior to proceeding with construction.

G. Arrange progress of the work so that all roughing-in may be installed and tested before concealed. No piping of any description shall be concealed or covered until it has been tested by the Contractor, witnessed by the Owner's Inspector, and approved by the Owner. All piping shall be installed promptly so that openings may be closed up as promptly as this work permits.

H. All horizontal run or pipe shall be well secured in place with forges steel hangers and supports, set not over 5′ on centers. All piping shall be in direct parallel lines with each other and with walls or columns, and shall be properly spaced with separators where two or more run together.

I. Grade horizontal drain pipes as follows, except as approved and as indicated on drawings:

1. 2" 1/4" per foot, minimum
2. 3" and larger 1/8" per foot, minimum

J. Make changes in pipe sizes on drain lines with reducing fittings or recessed reducers. Make changes in direction by appropriate use of 45-degree wyes, longsweep 1/6, 1/8, or 1/16 bends. Short-radius fittings shall not be permitted, except in approved location.

K. PVC piping shall not be installed in return-air plenums, through fire walls, or any location not allowed by the Building Code.

3.2 DRAINAGE PIPING

A. All horizontal branch drainage shall be run at a uniform grade of 1/4" per foot. All changes in direction or drainage piping shall be made with 45 degree wyes, long-turn tee wyes or long sweep bends.

3.3 PIPE HANGERS

A. All vertical and horizontal piping shall be secured and rigidly supported and held in place. All hangers shall be suitable for piping being supported and shall be sized to accommodate pipe with insulation jacketing.

B. Hanger rods shall have sufficient threads to insure proper adjustment of pipe grades, etc. All new horizontal piping 2" and larger shall have hangers not more that 5′ apart. Hangers shall be installed no more than 18" from points where piping changes direction. All hanger rods shall be of proper size to support piping, 1/2" diameter minimum.

C. Special hangers shall be provided where necessary; piping shall be supported and anchored wherever needed to carry weight, prevent sagging and eliminate vibration, or as directed by the Owner or Owner's Architect.

3.4 INSULATION

A. All fittings, etc., in insulated storm drainage pipe lines shall be insulated with mitered segments,

coated with two coats of vapor barrier mastic, reinforced with glass fabric extending two inches onto adjacent pipes, and same diameter as adjoining covering where practicable.

B. All joints in insulation shall be neatly and securely made. Laps in jackets shall be turned away form normal view where practical.

C. All drain bowls shall be completely covered with new 1-inch thick Fiberglass insulation.

3.5 INSPECTION AND TESTS

A. Upon request, all new piping of the plumbing system shall be tested in the presence of the Owner or Owner's Architect.

B. Tests shall be made as required and/or as described below

C. The piping of plumbing drainage systems shall be tested upon completion of the rough piping installation by water or air and proved watertight. Tests shall be performed by either of the following methods:

1. Water Test: The water test shall be applied to the *drainage system* either in its entirety (new work) or in sections after rough piping has been installed.
   a. Where applied to the entire system (new work), all openings in the piping shall be closed, except the highest opening, and the system shall be filled with water almost to the point of overflow. Do not overflow at built-up roofs.
   b. Where the system is tested in sections, each opening shall be plugged, except the highest opening of the section under test, and each section shall be filled with water. A section shall not be tested with less than a 10-foot head of water.
   c. The water shall be kept in the system or in the portion under test for a minimum of one hour before inspection starts. The system shall then be tight at all points.
2. Air Test: The air test shall be made by attaching an air compressor testing apparatus to an opening and, after closing all other inlets and outlets to the system, forcing air into the system until there is a gauge pressure of 5 pounds per square inch (34 Pa) or a pressure not less than a 10-inch column of mercury. This pressure shall be held without introduction of additional air for a minimum period of 30 minutes.

D. All tests shall be repeated the number of times required to provide the complete absence of leaks.

E. The new plumbing system shall be tested by the Contractor in the presence of the Architect. Governing authorities having jurisdiction shall be notified of test required by them, and Final Acceptance of work shall be contingent upon their approval. At least 48 hours notice shall be given prior to test. All costs of conducting test and furnishing necessary equipment for test shall be borne by the Contractor.

F. The new drain and vent system shall be tested and proved tight prior to connection of fixtures, by closing all openings, except highest at roof, and filling with water to point of overflow. Allow water to stand at least 2 hours before starting inspection. Where piping must be tested in sections to facilitate construction, include at least the upper 10 feet of the preceding section so that no pipe or joint in building will have been subjected to less than 10 feet head of water. Owner shall be

provided 24 hours notice prior to tests and provided written results of tests.

G. Clean pipe and fittings of grease, metal cuttings, and sludge accumulated by operations of system for testing. Stoppage or discoloration or other damage to parts of building, its finish or furnishings due to Contractor's failure to properly clean piping system shall be repaired without cost to the Owner.

3.6 ROOF DRAINS

A. Install roof drains in accordance with the manufacturer's instructions, rigid to the deck, straight and true so as not to cause eccentric stresses on the roof deck or on the roof membrane.

3.7 COORDINATION

A. All required mechanical and electrical work required to complete the new roof system installation shall be performed by a licensed mechanical or electrical contractor. All mechanical and electrical work shall comply with all applicable codes and the Contractor shall be responsible for providing all required inspections at no additional cost to the Owner.

END OF SECTION 150000

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SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Temporary erosion- and sedimentation-control measures.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.

D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings.

G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Burbank Elementary School in Hampton, Virginia.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

D. Utility Locator Service: Notify Miss Utility for area where Project is located before site clearing.

E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

I. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain. Wrap a 1-inch blue vinyl tie tape flag around each tree trunk at 54 inches above the ground.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

A. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods for grubbing within protection zones.
4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to a depth of 4 to 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 8 feet.
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Preparing subgrades for walks, grasses, and plants.
2. Subbase course for concrete walks.
3. Subsurface drainage backfill for trenches.
4. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Sections:
1. Section 311000 "Site Clearing" for site stripping, grubbing, stripping, stockpiling, topsoil, and removal of above- and below-grade improvements and utilities.
2. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
3. Section 329300 "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices for earth moving specified in Section 012200 "Unit Prices."

B. Quantity allowances for earth moving are included in Section 012100 "Allowances."

1.4 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices for the changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

G. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698.

C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

B. Preexcavation Conference: Conduct conference at Burbank Elementary School in Hampton, Virginia.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify "Miss Utility" for area where Project is located before beginning earth moving operations.

D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Section 311000 "Site Clearing" are in place.

E. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

F. Do not direct vehicle or equipment exhaust towards protection zones.

G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

1. Liquid Limit: 40
2. Plasticity Index: 15

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

E. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
4. Tear Strength: 56 lbf; ASTM D 4533.
5. Puncture Strength: 56 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 70 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.5 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 8 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.7 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.8 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.9 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill voids with satisfactory soil while removing shoring and bracing.

D. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

E. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.

F. Place and compact final backfill of satisfactory soil to final subgrade elevation.

G. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

3.10 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.11 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
2. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
3. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.13 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.

3.14 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Section 334600 "Subdrainage."

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick.

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.
2. Place and compact impervious fill over drainage backfill in 6-inch-thick compacted layers to final subgrade.

3.15 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.16 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 QUALITY ASSURANCE

A. Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of stamped concrete paving systems.

B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.2 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, gray portland cement Type I.

B. Normal-Weight Aggregates: ASTM C 33, Class 4S, uniformly graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: Potable and complying with ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

2.3 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz. /sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

RELATED MATERIALS

D. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.

E. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

F. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:

1. Types I and II, non-load bearing for bonding hardened or freshly mixed concrete to hardened concrete.

2.4 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that meet or exceed requirements.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi.
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
3. Slump Limit: 4 inches, plus or minus 1 inch.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 5-1/2 percent plus or minus 1.5 percent for 1-1/2-inch nominal maximum aggregate size.
2. Air Content: 6 percent plus or minus 1.5 percent for 1-inch nominal maximum aggregate size.
3. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in concrete as required for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.5 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete batches of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
1. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows, to match jointing of existing adjacent concrete paving:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.

D. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes.

3.5 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation.

B. Remove snow, ice, or frost from subbase surface before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Screed paving surface with a straightedge and strike off.

H. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

I. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

J. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.

b. Continuous water-fog spray.
c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.8 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/2 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch, no minus.
6. Joint Width: Plus 1/8 inch, no minus.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

F. Concrete paving will be considered defective if it does not pass tests and inspections.

G. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

H. Prepare test and inspection reports.

3.10 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Erosion-control material(s).

B. Related Requirements:

1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.
2. Section 334600 "Subdrainage" for below-grade drainage of landscaped areas.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" and drawing designations for planting soils.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture. Include identification of source and name and telephone number of supplier.

C. Product Certificates: For fertilizers, from manufacturer.

D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
2. Experience: Three years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:

    a. Landscape Industry Certified Technician - Exterior.
    b. Landscape Industry Certified Lawncare Manager.
    c. Landscape Industry Certified Lawncare Technician.

5. Pesticide Applicator: State licensed, commercial.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.

C. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species:

1. Quality: State-certified seed of grass species as listed below for solar exposure.
2. Quality: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
3. Full Sun: Bermudagrass (Cynodon dactylon).
4. Full Sun: Kentucky bluegrass (Poa pratensis), a minimum of three cultivars.
5. Sun and Partial Shade: Proportioned by weight as follows:

    a. 50 percent Kentucky bluegrass (Poa pratensis).
    b. 30 percent chewings red fescue (Festuca rubra variety).
    c. 10 percent perennial ryegrass (Lolium perenne).
    d. 10 percent redtop (Agrostis alba).

6. Shade: Proportioned by weight as follows:

    a. 50 percent chewings red fescue (Festuca rubra variety).
    b. 35 percent rough bluegrass (Poa trivialis).
    c. 15 percent redtop (Agrostis alba).

2.2 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Sphagnum Peat Mulch: Partially decomposed sphagnum peat moss, finely divided or of granular texture, and with a pH range of 3.4 to 4.8.

C. Muck Peat Mulch: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent, and containing no sand.

D. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

E. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

F. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

G. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.4 PESTICIDES

A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.5 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.

B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.

C. Erosion-Control Mats: Cellular, nonbiodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 3-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Invisible Structures, Inc; Slopetame 2.
b. Presto Products Company; Geoweb.
c. Tenax Corporation - USA; Tenweb.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."

B. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade.

1. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area Preparation" Article.

B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.

C. Fill cells of erosion-control mat with planting soil and compact before planting.

D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.

1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
2. Do not use wet seed or seed that is moldy or otherwise damaged.
3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 2 lb/1000 sq. ft**.**

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 1:3 with erosion-control blankets and 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with erosion-control mats where indicated on Drawings; install and anchor according to manufacturer's written instructions.

F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
2. Bond straw mulch by spraying with asphalt emulsion at a rate of 10 to 13 gal. /1000 sq. ft**.** Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.

G. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.

3.6 HYDROSEEDING

A. Hydroseeding: Mix specified seed, commercial fertilizer and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with fiber-mulch manufacturer's recommended tackifier.
2. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.
3. Spray-apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre.

3.7 SODDING

A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across slopes exceeding 1:3.
2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.8 TURF RENOVATION

A. Renovate existing turf where indicated.

B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
2. Install new planting soil as required.

C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

E. Mow, dethatch, core aerate, and rake existing turf.

F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.

I. Apply initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.

J. Apply seed and protect with straw mulch as required for new turf.

K. Water newly planted areas and keep moist until new turf is established.

3.9 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow bentgrass to a height of 1/2 inch or less.
2. Mow bermudagrass to a height of 1/2 to 1 inch.
3. Mow perennial ryegrass, zoysiagrass to a height of 1 to 2 inches.
4. Mow Kentucky bluegrass, annual ryegrass, to a height of 1-1/2 to 2 inches.
5. Mow turf-type tall fescue to a height of 2 to 3 inches.

D. Turf Postfertilization: Apply commercial fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.10 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
3. Satisfactory Plugged Turf: At end of maintenance period, the required number of plugs has been established as well-rooted, viable patches of grass, and areas between plugs are free of weeds and other undesirable vegetation.
4. Satisfactory Sprigged Turf: At end of maintenance period, the required number of sprigs has been established as well-rooted, viable plants, and areas between sprigs are free of weeds and other undesirable vegetation.

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.11 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.12 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove nondegradable erosion-control measures after grass establishment period.

3.13 MAINTENANCE SERVICE

A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:

1. Seeded Turf: 60 days from date of planting completion.

a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

2. Sodded Turf: 30 days from date of planting completion.

END OF SECTION 329200

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SECTION 334100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Nonpressure transition couplings.
3. Cleanouts.
4. Drains.
5. Manholes.
6. Channel drainage systems.
7. Catch basins.
8. Stormwater inlets.
9. Stormwater detention structures.
10. Pipe outlets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. Catch basins, and stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.
3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

B. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet and vertical scale of not less than 1 inch equals 5 feet. Indicate

manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

C. Field quality-control reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner, and Engineer no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.

1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
2. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.

B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294M, Type S, with smooth waterway for coupling joints.

1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
2. Soiltight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

2.2 PVC PIPE AND FITTINGS

A. PVC Gravity Sewer Piping:

1. Pipe and Fittings: ASTM F 679, T-1 wall thickness, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.

2.3 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
   1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

   1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

      a. Dallas Specialty & Mfg. Co.
      b. Fernco Inc.
      c. Logan Clay Pipe.
      d. Mission Rubber Company; a division of MCP Industries, Inc.
      e. NDS Inc.
      f. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

   3. Description: Elastomeric sleeve with corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

      a. Cascade Waterworks Mfg.
      b. Dallas Specialty & Mfg. Co.
      c. Mission Rubber Company; a division of MCP Industries, Inc.

   3. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Fernco Inc.
    b. Logan Clay Pipe.
    c. Mission Rubber Company; a division of MCP Industries, Inc.

3. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.4 CLEANOUTS

A. Plastic Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Canplas LLC.
    b. IPS Corporation.
    c. NDS Inc.
    d. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
    e. Sioux Chief Manufacturing Company, Inc.
    f. Zurn Light Commercial Products Operation; Zurn Plumbing Products Group.

3. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.5 DRAINS

A. PVC Area Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
3. Top-Loading Classification(s): Medium Duty.

2.6 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP steps. galvanized steel, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Designed Precast Concrete Manholes:

1. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.
3. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
4. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
5. Steps: Individual FRP steps. galvanized steel, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
6. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
7. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope.

C. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange and 26-inch-diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.7 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

    a. Invert Slope: 1 percent through manhole.

2. Benches: Concrete, sloped to drain into channel.

    a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.8 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.

3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
8. Steps: Individual FRP steps. galvanized steel, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Designed Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for joint sealants.

1. Joint Sealants: ASTM C 990, bitumen or butyl rubber.
2. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inchtotal thickness, that match 24-inch-diameter frame and grate.
4. Steps: Individual FRP steps. galvanized steel, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
5. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 by 24 inches minimum unless otherwise indicated.
2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

D. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.9 STORMWATER DETENTION STRUCTURES

A. Cast-in-Place Concrete, Stormwater Detention Structures: Constructed of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.

1. Ballast: Increase thickness of concrete as required to prevent flotation.
2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
3. Steps: Individual FRP steps. galvanized steel, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.

B. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

2.10 PIPE OUTLETS

A. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."

1. Average Size: NSSGA No. R-3, screen opening 2 inches.
2. Average Size: NSSGA No. R-4, screen opening 3 inches.
3. Average Size: NSSGA No. R-5, screen opening 5 inches.

B. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves,

and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.
2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install piping with 18-inch minimum cover.
4. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
5. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
6. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
7. Install corrugated steel piping according to ASTM A 798/A 798M.
8. Install corrugated aluminum piping according to ASTM B 788/B 788M.
9. Install ABS sewer piping according to ASTM D 2321 and ASTM F 1668.
10. Install PE corrugated sewer piping according to ASTM D 2321.
11. Install PVC cellular-core piping according to ASTM D 2321 and ASTM F 1668.
12. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
13. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
14. Install PVC water-service piping according to ASTM D 2321 and ASTM F 1668.
15. Install fiberglass sewer piping according to ASTM D 3839 and ASTM F 1668.
16. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
17. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

G. Install force-main pressure piping according to the following:

1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
2. Install piping with 18-inch minimum cover.
3. Install ductile-iron pressure piping according to AWWA C600 or AWWA M41.
4. Install ductile-iron special fittings according to AWWA C600.
5. Install PVC pressure piping according to AWWA M23, or ASTM D 2774 and ASTM F 1668.
6. Install PVC water-service piping according to ASTM D 2774 and ASTM F 1668.

H. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless cast-iron soil pipe and fittings.
3. Ductile-iron pipe and fittings.
4. Expansion joints and deflection fittings.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
4. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
5. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
6. Join corrugated steel sewer piping according to ASTM A 798/A 798M.
7. Join corrugated aluminum sewer piping according to ASTM B 788/B 788M.
8. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomeric-seal joints.
9. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
10. Join PVC cellular-core piping according to ASTM D 2321 and ASTM F 891 for solvent-cemented joints.
11. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.
12. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
13. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
14. Join fiberglass sewer piping according to ASTM D 3839 for elastomeric-seal joints.
15. Join nonreinforced-concrete sewer piping according to ASTM C 14 and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
16. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
17. Join dissimilar pipe materials with nonpressure-type flexible couplings.

B. Join force-main pressure piping according to the following:

1. Join ductile-iron pressure piping according to AWWA C600 or AWWA M41 for push-on joints.
2. Join ductile-iron special fittings according to AWWA C600 or AWWA M41 for push-on joints.
3. Join PVC pressure piping according to AWWA M23 for gasketed joints.
4. Join PVC water-service piping according to ASTM D 2855 for solvent-cemented joints.
5. Join dissimilar pipe materials with pressure-type couplings.

3.4 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 DRAIN INSTALLATION

A. Install type of drains in locations indicated.

1. Use Light-Duty, top-loading classification drains in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification drains in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification drains in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification drains in roads.

B. Embed drains in 4-inch minimum concrete around bottom and sides.

C. Fasten grates to drains if indicated.

D. Set drain frames and covers with tops flush with pavement surface.

E. Assemble trench sections with flanged joints.

F. Embed trench sections in 4-inch minimum concrete around bottom and sides.

3.6 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.7 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.8 STORMWATER INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipaters at outlets, as indicated.

3.9 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.10 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."

B. Connect force-main piping to building's storm drainage force mains specified in Section 221413 "Facility Storm Drainage Piping." Terminate piping where indicated.

C. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

D. Connect to sediment interceptors specified in Section 221323 "Sanitary Waste Interceptors."

E. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

a. Unshielded flexible couplings for same or minor difference OD pipes.
b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

2. Use pressure-type pipe couplings for force-main joints.

3.11 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.12 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

    a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
    b. Option: Test plastic piping according to ASTM F 1417.
    c. Option: Test concrete piping according to ASTM C 924.

6. Force-Main Storm Drainage Piping: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psig.

    a. Ductile-Iron Piping: Test according to AWWA C600, "Hydraulic Testing" Section.
    b. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.13 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION 334100

SECTION 334600 - SUBDRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Perforated-wall pipe and fittings.
2. Drainage conduits.
3. Geotextile filter fabrics.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Drainage conduits, including rated capacities.
2. Geotextile filter fabrics.

PART 2 - PRODUCTS

2.1 PERFORATED-WALL PIPES AND FITTINGS

A. Perforated PVC Sewer Pipe and Fittings: ASTM D 2729, bell-and-spigot ends, for loose joints.

2.2 SOIL MATERIALS

A. Soil materials are specified in Section 312000 "Earth Moving."

2.3 GEOTEXTILE FILTER FABRICS

A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D 4491.

B. Structure Type: Nonwoven, needle-punched continuous filament.

1. Survivability: AASHTO M 288 Class 2.
2. Styles: Flat and sock.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.3 PIPE JOINT CONSTRUCTION

A. Join perforated PVC sewer pipe and fittings according to ASTM D 3212 with loose bell-and-spigot, push-on joints.

B. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

3.4 CLEANOUT INSTALLATION

A. Comply with requirements for cleanouts specified in Section 334100 "Storm Utility Drainage Piping."

B. Cleanouts for Subdrainage:

1. Install cleanouts from piping to grade. Locate cleanouts at beginning of piping run and at changes in direction. Install fittings so cleanouts open in direction of flow in piping.
2. In vehicular-traffic areas, use NPS 4 cast-iron soil pipe and fittings for piping branch fittings and riser extensions to cleanout. Set cleanout frames and covers in a cast-in-place concrete anchor, 18 by 18 by 12 inches deep. Set top of cleanout flush with grade.
3. In nonvehicular-traffic areas, use NPS 4 PVC pipe and fittings for piping branch fittings and riser extensions to cleanout. Set cleanout frames and covers in a cast-in-place concrete anchor, 12 by 12 by 4 inches deep. Set top of cleanout 1 inch above grade.
4. Comply with requirements for concrete specified in Section 033000 "Cast-in-Place Concrete."

3.5 CONNECTIONS

A. Comply with requirements for piping specified in Section 334100 "Storm Utility Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect low elevations of subdrainage system to solid-wall-piping storm drainage system.

3.6 IDENTIFICATION

A. Arrange for installation of green warning tapes directly over piping. Comply with requirements for underground warning tapes specified in specified in Section 312000 "Earth Moving."

1. Install PE warning tape or detectable warning tape over ferrous piping.
2. Install detectable warning tape over nonferrous piping and over edges of underground structures.

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling.
2. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

B. Drain piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 CLEANING

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 334600

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END OF TECHNICAL SPECIFICATIONS